FIBRE to SATA II
RAID SUBSYSTEM

User Manual

Revision 1.4

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Preface

About this manual

This manual provides information regarding the quick installation and hardware features of the **42 Bays RAID subsystem**. This document also describes how to use the storage management software. Information contained in the manual has been reviewed for accuracy, but not for product warranty because of the various environment/OS/settings. Information and specifications will be changed without further notice.

This manual uses section numbering for every topics being discussed for easy and convenient way of finding information in accordance with the user's needs. The following icons are being used for some details and information to be considered in going through with this manual:

NOTES:
These are notes that contain useful information and tips that the user must give attention to in going through with the subsystem operation.

IMPORTANT!
These are the important information that the user must remember.

WARNING!
These are the warnings that the user must follow to avoid unnecessary errors and bodily injury during hardware and software operation of the subsystem.

CAUTION:
These are the cautions that user must be aware to prevent damage to the equipment and its components.

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Changes

The material in this document is for information only and is subject to change without notice.

Before You Begin

Before going through with this manual, you should read and focus on the following safety guidelines. Notes about the subsystem's controller configuration and the product packaging and delivery are also included here.

Safety Guidelines

To provide reasonable protection against any harm on the part of the user and to obtain maximum performance, user is advised to be aware of the following safety guidelines particularly in handling hardware components:

Upon receiving of the product:

- Place the product in its proper location.
- Do not try to lift it by yourself alone. Two or more persons are needed to remove or lift the product to its packaging. To avoid unnecessary dropping out, make sure that somebody is around for immediate assistance.
- It should be handled with care to avoid dropping that may cause damage to the product. Always use the correct lifting procedures.

Upon installing of the product:

- Ambient temperature is very important for the installation site. It must not exceed 30°C. Due to seasonal climate changes; regulate the installation site temperature making it not to exceed the allowed ambient temperature.
- Before plugging-in any power cords, cables and connectors, make sure that the power switches are turned off. Disconnect first any power connection if the power supply module is being removed from the enclosure.
- Outlets must be accessible to the equipment.
- All external connections should be made using shielded cables and as much as possible should not be performed by bare hand. Using anti-static hand gloves is recommended.
- In installing each component, secure all the mounting screws and locks. Make sure that all screws are fully tightened. Follow correctly all the listed procedures in this manual for reliable performance.

Controller Configurations

This RAID subsystem supports both single controller and dual controller configurations. The single controller can be configured depending on the user's requirements. On the other side, these controllers can be both configured and be active to increase system efficiency and to improve performance.

This manual will discuss and focus on a dual controller configuration. Nevertheless, differences and comparisons will be added for further information and understanding.

Packaging, Shipment and Delivery

- Before removing the subsystem from the shipping carton, you should visually inspect the physical condition of the shipping carton.
- Unpack the subsystem and verify that the contents of the shipping carton are all there and in good condition.
- Exterior damage to the shipping carton may indicate that the contents of the carton are damaged.
- If any damage is found, do not remove the components; contact the dealer where you purchased the subsystem for further instructions.

Unpacking the Storage Subsystem

This is the shipping package.

Verify if the shipped package is in good condition. Follow the steps below to unpack the shipping package.

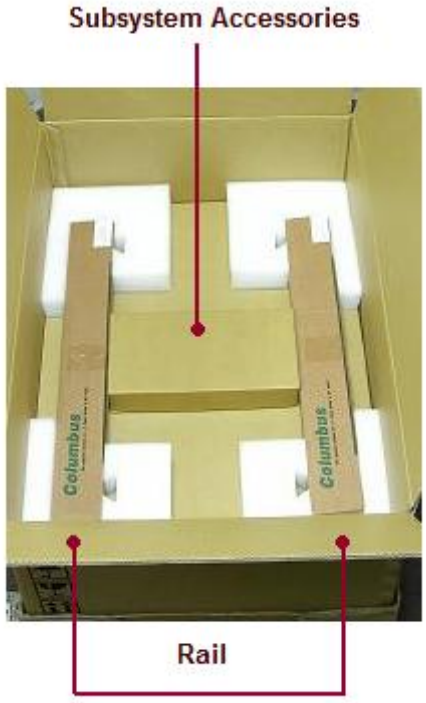
1. Cut the tapes that close the box cover.
2. Open the box cover. The components are supported by flat foam covering the whole upper layer inside the box. Carefully remove this top cover.

3. Remove the disk trays. Check if there are 42 disk trays and check each for damage.

NOTE: If any damage is found, contact the dealer or sales representative for assistance.

NOTE: When the disk drives are already attached to the disk trays and there is a need to remove the disk drives from the RAID enclosure, use this disk tray box which are numbered 1 to 42 for convenience and avoid mix up of disk drives arrangement.

4. Below the disk trays are the accessories and rail kit (optional). Remove the two boxes of rail kit (if there is) and the box of the accessories. Open them. Check if they are complete.

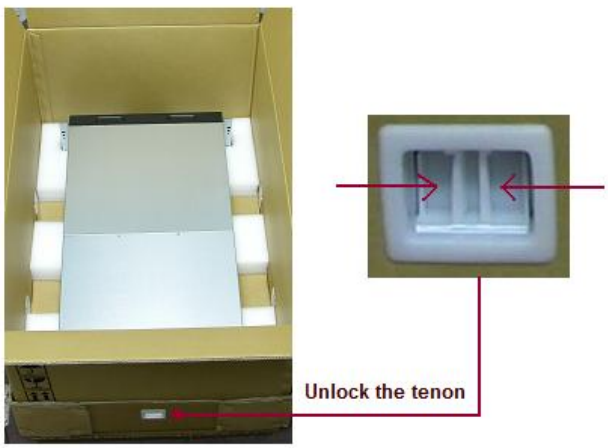


Accessories:

	Three power cords
	Two external serial cables, RS232 DB9F-to-Phone Jack Note: Only one serial cable for Single Controller subsystem
	One RJ-45 Ethernet cable
	One RJ-45 crossover Ethernet cable
	Four external Fibre optical cables Note: Only two Fibre cables for Single Controller subsystem
	Installation and User Manual

NOTE: If any damage is found, contact the dealer or sales representative for assistance.

5. The unit is located at the most bottom part inside the box. To remove the unit, unlock the tenon. Check for its physical condition.



6. After unlocking the tenon, remove the box above. Remove the RAID subsystem and place it in appropriate location.

Chapter 1 Product Introduction

This manual provides information regarding the installation, maintenance, and software management of the **EPICa** RAID subsystem.

EPICa RAID Subsystem

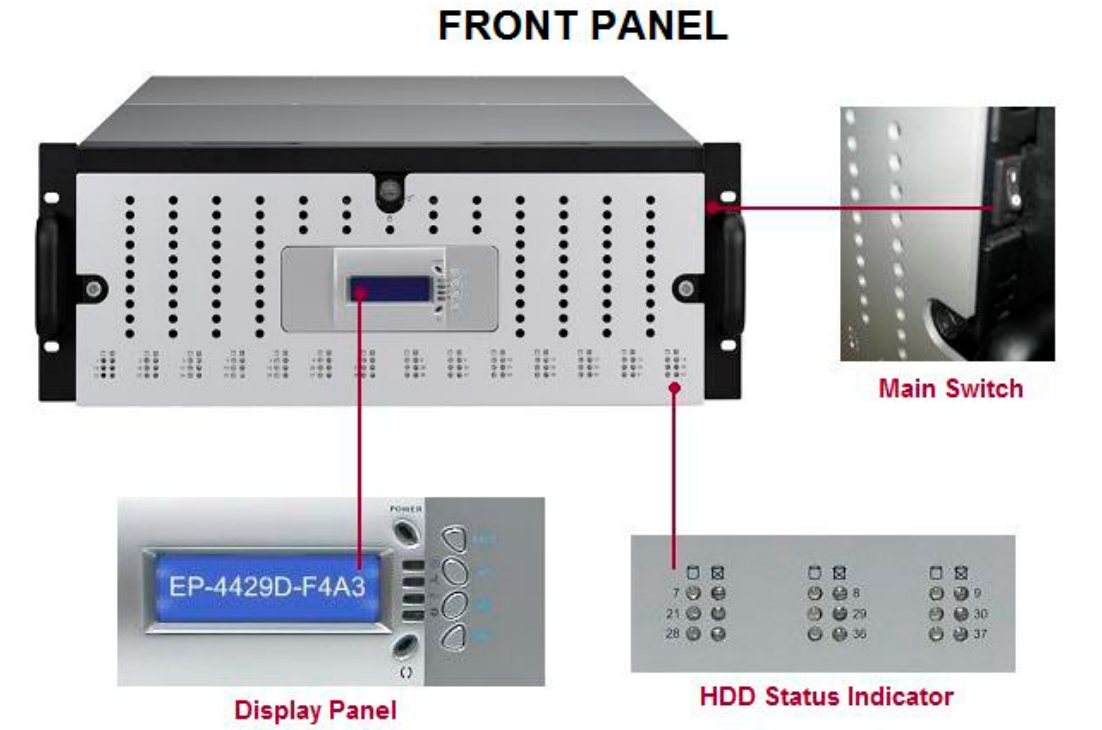
The **EPICa** RAID subsystem features 4Gb Fibre host channels for increased system efficiency and performance. It features high capacity expansion with 42 hot-swappable SATA hard disk drive bays in a 19-inch 4U rackmount unit, scaling to a maximum storage capacity in the terabyte range.

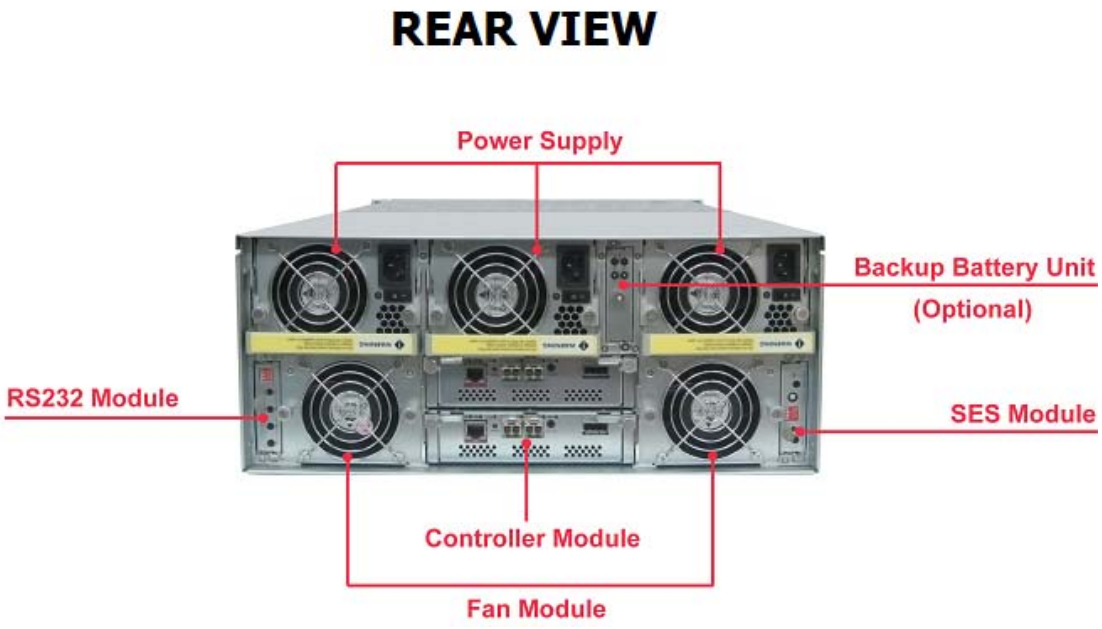
EPICa's enclosure is designed for maximum expandability and flexibility. EPICa uses only common modules. For any system to be able to meet the needs of future requirements, expandability is essential. EPICa was designed for future expandability. With EPICa, the power supply and fan units are enclosed with the same module. Combined with a larger module volume and a larger fan unit, a more powerful power supply can be used because of better airflow. The Airflow Redirector eliminates pockets of dead air to prevent overheating of the subsystem.

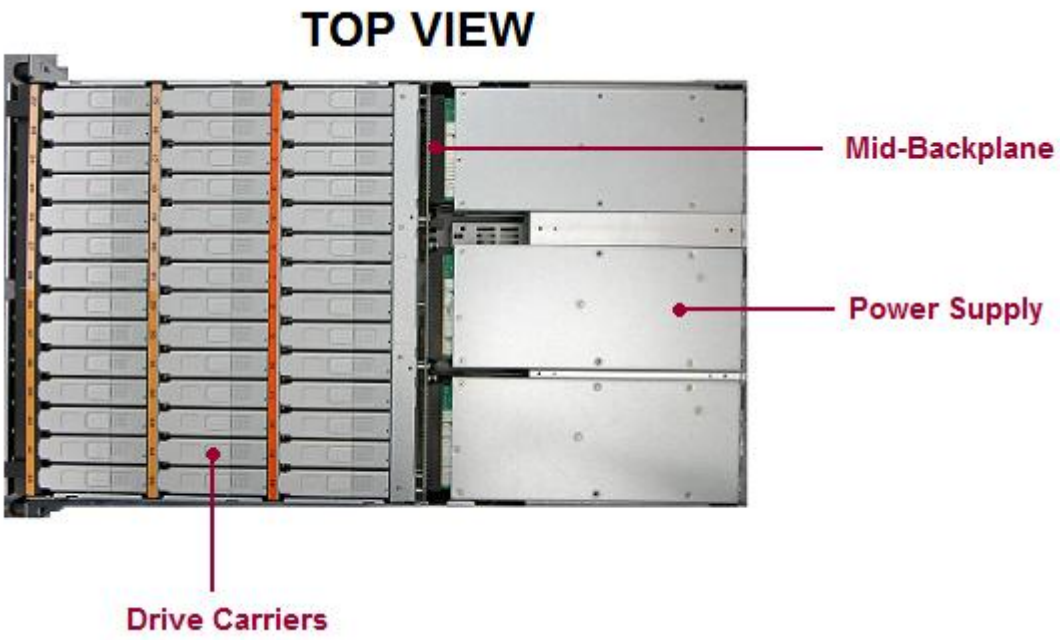
EPICa incorporates a cableless design which means less connectors are used. Less connectors result in better signal stability. In addition, EPICa uses hi-quality connectors for maximum signal integrity.

Every system needs environmental control system to regulate the internal environment of the subsystem. EPICa's SES is the mainstay of the environment control. With SES you have a proven standard protocol for environmental control.

1.1 Identifying Parts of the EPICa RAID Subsystem






TOP VIEW
Mid-Backplane
Power Supply
Drive Carriers

1.2 Technical Specifications

Listed below are the comparison of the technical specifications of single controller and dual controller subsystem.

Model	EP-4429S-F4A3	EP-4429D-F4A3
RAID Controller	4Gb FC-SATA Single	4Gb FC-SATA Redundant
Host Interface	4Gb FC x 2 Up to 400MB/s per Channel 512 Command Queue Depth	4Gb FC x 4 Up to 400MB/s per Channel 512 Command Queue Depth
Disk Interface	3.0Gb SATA SATA I / SATA II	3.0Gb SATA SATA I / SATA II
Capacity		
- Direct Attached	31.5TB (at 750GB SATA drive)	31.5TB (at 750GB SATA drive)
- Expansion	Up to 63 TB (at 750GB SATA drive)	Up to 63 TB (at 750GB SATA drive)
Processor Type	533MHz RISC AMCC 440SPe Embedded R6 XOR Engine	533MHz RISC AMCC 440SPe Embedded R6 XOR Engine
Cache Memory	512MB ~ 2GB 667 MHz DDR II ECC SDRAM	1GB ~ 4GB 667 MHz DDR II ECC SDRAM
Battery Backup	72 hrs (Optional)	72 hrs (Optional)
Management Port	10/100/1000 Ethernet auto sensing	10/100/1000 Ethernet auto sensing
Monitor Port	RS232	RS232
RAID Features		
RAID level	0, 1, 10, 5, 6	0, 1, 10, 5, 6
Array Group	Up to 64	Up to 64
LUNs	Up to 1024	Up to 1024
Online RAID Expansion	Yes	Yes
Global / Local Hot Spare	Yes	Yes
Drive Roaming	Yes	Yes
Immediate RAID Availability	Yes	Yes
Cache Policy Management	Yes	Yes
Online Rebuild	Yes	Yes
Variable Stripe Size	Yes	Yes
Remote Notification	E-mail	E-mail
Dual Controller Redundancy	-	Active – Active w/Mirrored Cache

Enclosure		
Platform	Rackmount	Rackmount
Form Factor	4U	4U
# of Hot Swap Trays	42	42
Tray Lock	Yes, w/ Lock Indicator	Yes, w/ Lock Indicator
Disk Status Indicator	Access / Fail LED w/170° view	Access / Fail LED w/170° view
Backplane	3Gb SATA II Single BP	3Gb SATA II Single BP
Enclosure Monitoring (SES)	In Band SES via SAS	In Band SES via SAS
# of PS/Fan Modules	600W x 3 w/PFC	600W x 3 w/PFC
# of Fans per Module	2 (Multi-speed)	2 (Multi-speed)
Max. Air Flow	400CFM	400CFM
Air Flow Redirector	Yes	Yes
Power requirements	AC 90V ~ 264V Full Range 10A~5A at 110V/220V, 50Hz~60Hz	AC 90V ~ 264V Full Range 10A~5A at 110V/220V, 50Hz~60Hz
Environmental		
Relative Humidity	10% ~ 85% Non-condensing	10% ~ 85% Non-condensing
Operating Temperature	10°C ~ 40°C (50°F ~ 104°F)	10°C ~ 40°C (50°F ~ 104°F)
Physical Dimension	752.4(L) x 482.6(W) x 176(H)mm	752.4(L) x 482.6(W) x 176(H)mm
Weight (Without Disk)	45.1 Kg	46.1 Kg

Chapter 2 Physical Components

2.1 Controller Module

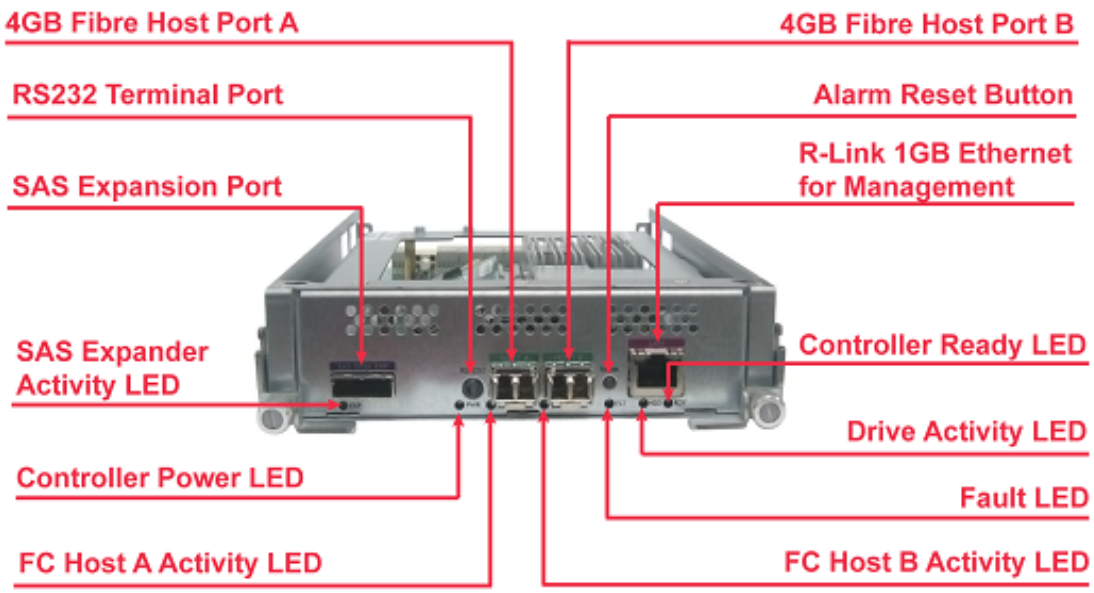
The EPICa includes a 4Gb Fibre-to-SATA Controller Module.

Controller Module

Some of the features of the 4Gb FC-SATA controller are as follows:

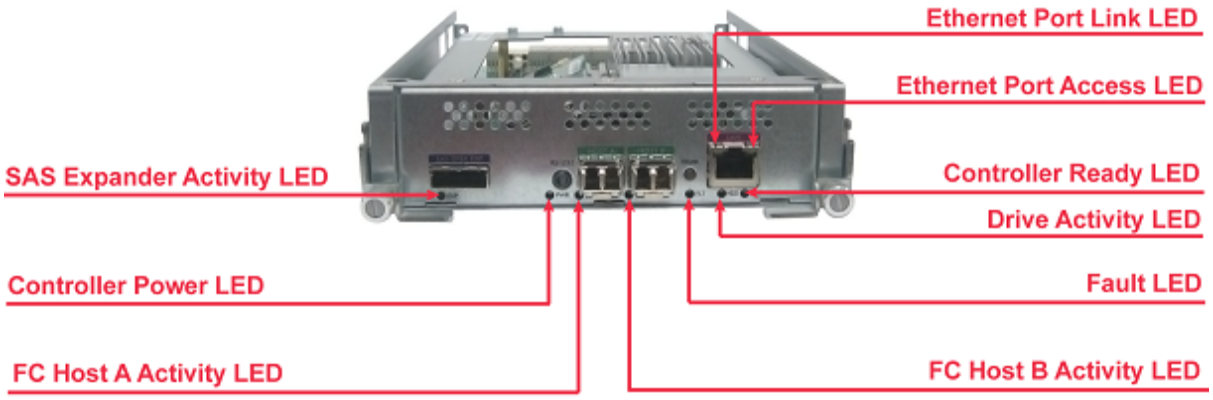
1. AMCC 440 SPe 64-bit RISC CPU
2. The controller supports RAID levels 0, 1, 5, 6, and 10
3. Controller Redundancy via MPIO
4. 512MB ~ 2 GB DDR2 Cache per Controller
5. Two FC/4G host channels
6. One wide port (4 lane) SAS disk expansion port

2.1.1 Controller Module Panel



2.1.2 Controller Module LEDs

The controller LEDs displayed on the back of the controller is represented graphically in the enclosure back view.



Indicator	Color	Description
SAS Expander Activity	Green	Solid when an expander is connected and no activity. Flashes when there is activity on the expander.
Power	Green	Solid when power is available to the controller.
FC Host A Activity	Green	Solid when FC Port A is up and no activity. Flashes when there is activity on FC Port A.
	Red	Solid when FC Port A is down or disconnected.
FC Host B Activity	Green	Solid when FC Port B is up and no activity. Flashes when there is activity on FC Port B.
	Red	Solid when FC Port B is down or disconnected.
Fault	Red	Solid if a fault is detected that activates the alarm.
Controller Ready	Green	Solid when the controller is ready.
Drive Activity	Green	Flashes when there is activity on any drive (in any enclosure).
Link LED	Green	Solid when connected to a functioning 1000BaseT. Off when not connected or connected to a 10BaseT network.
	Orange	Solid when connected to a functioning 100BaseT network. Off when not connected or connected to a 10BaseT network.
Access LED	Green	Flashes when there is activity on the network.

2.1.3 Controller Module Installation

In this section, you will be shown how to install the Controller Module.

a. Check for damage, especially to the connectors at the rear of the Controller Module.

CAUTION! Handle the module with care and avoid damaging the connectors. Do not install the module if the connectors are damaged.

b. With the two handles (with thumb screws) in the open position, carefully insert the controller module into the enclosure.

Controller Module in Lower Slot

NOTE: The two Controller Modules are inserted in upside-down position into the lower and upper slots. Lower slot is for Controller 1, and the upper slot is for Controller 2.

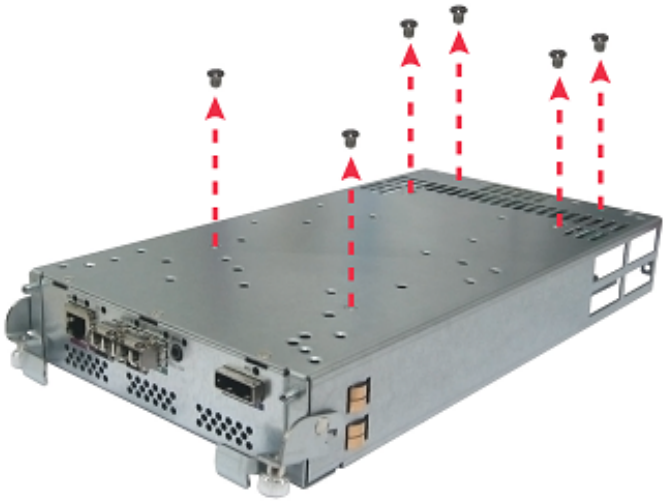
c. To complete the Controller Module installation, close the handles by turning them at 45° angle until they lock onto the enclosure.

d. Tighten the thumb screws on the two handles to secure the Controller Module to the enclosure.

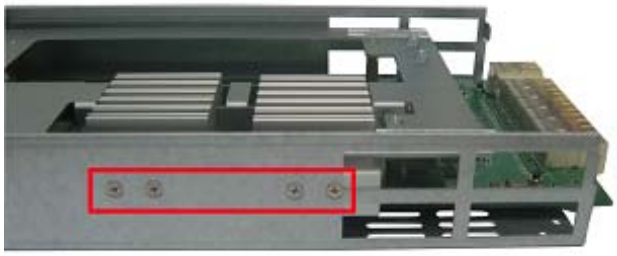
2.1.4 Controller Board Replacement

NOTE: It is necessary to use ESD anti-static device when handling sensitive parts of the controller module.

1. Remove the controller module from the enclosure.
2. Remove the six screws on the bottom of the module.



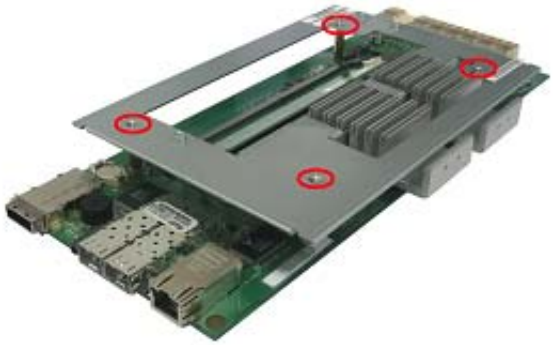
3. Remove the four screws that hold the two heat sinks on the side of the controller module case.



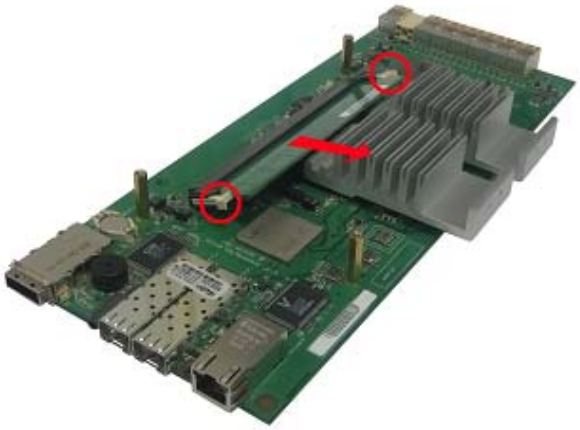
4. Remove the two SFP modules on Fibre host channels A and B.

5. To remove the controller board from the case, hold the top metal support and controller board then carefully pull away from the panel.

6. Unscrew the four screws of the metal support and remove the metal support.



7. Remove the memory module by releasing the lock on each side of the memory module.



8. Detach the heat sinks. Replace the controller board.

2.1.5 Upgrading Controller Firmware

NOTE: For upgrading the controller firmware, please refer to Administration chapter, Update Firmware section.

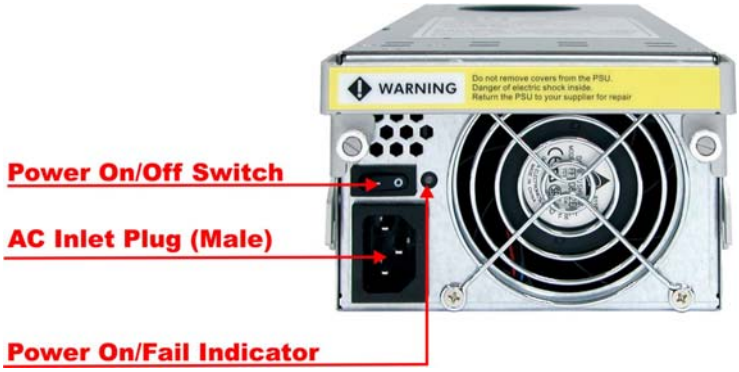
NOTE: In RAID subsystem with dual controller configuration, upgrading the firmware of one controller will also upgrade the firmware of the other controller, i.e., only one upgrade procedure is necessary to upgrade the firmware of each controller.

2.2 Power Supply / Fan Module

Every 42bay EPICa contains **three 600W Power Supply / Fan Modules**. All the PSFMs are inserted into the rear of the chassis.

NOTE: Each PSFM delivers Full-Range (90V - 254V) AC voltage of electricity. Each PSFM consists of 1 power supply and 2 fans.

2.2.1 PSFM Panel



On the back of the Power Supply/Fan Module there are three distinct features: the Power On/Off Switch, the AC Inlet Plug, and a Power On/Fail Indicator showing the Power Status LED, indicating ready or fail.

Each fan within a PSFM is powered independently of the power supply within the same PSFM. So if the power supply of a PSFM fails, the fan associated with that PSFM will continue to operate and cool the enclosure. In the event of a power supply failure, enclosure cooling is maintained by several methods.

1. One or both PSFMs will continue to maintain normal fan operations.
2. One or both PSFMs will increase their fan speeds to increase airflow.
3. One or both PSFMs will activate their Airflow Redirector.

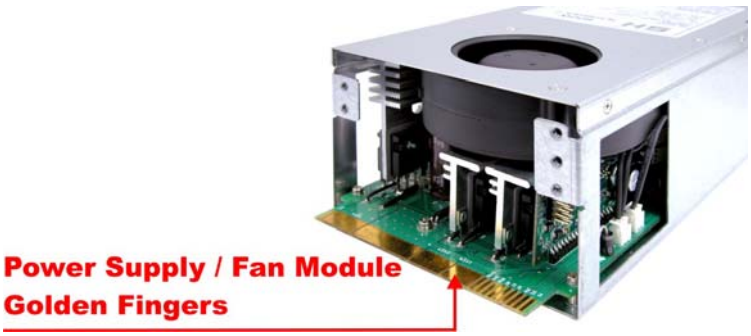
2.2.2 Power Supply Module LED

When the power cord connected from main power source is inserted to the AC Power Inlet, the power status LED becomes RED. When the switch of the PSFM is turned on, the LED still shows RED. After the main switch in front panel is turned on, the LED turns GREEN. When the Power On/Fail Light is GREEN, the PSFM is functioning normally.

2.2.3 Power Supply Installation

In this section, you will be shown how to install the Power Supply.

a. Check for damage, especially to the PCB Golden Fingers at the rear of the Power Supply.



CAUTION! Handle the module with care and avoid damaging the Golden Fingers. In addition, make sure there are no fingerprints on the Golden Fingers. Do not install the module if the Golden Fingers are damaged.

b. With the Power Supply handle in the open position, carefully insert the module into the enclosure.

c. Manually close the Power Supply handle. Tighten the thumb screws to secure the module to the enclosure.

d. Connect the Power Supply cord from the power source to the AC Power Inlet.

e. Do the same procedure with the remaining two power supplies.

IMPORTANT! For safety reasons, make sure the power switches are turned off when you plug-in the power cords. When removing the power cords, ensure that the main switch on the front panel and the switch on the back of each power supply fan module are turned off and the power on/fail LED are red (off).

2.2.4 Fan Replacement of PSFM

1. Remove the power supply fan module from the enclosure.
2. Unscrew 6 screws; 2 from left side, 2 from right side and 2 from top cover.

Two Screws from Left Side

Two Screws from Right Side

Two Screws from Top Cover

3. Push the top cover a little towards the golden fingers side.

4. Hold the top cover then pull up to detach the top cover from the power supply case.

5. Disconnect the two fan cables.

6. Remove 2 screws from the fan blower and replace the fan blower.

7. To replace the power supply fan, unscrew the 4 screws of the power supply fan. Then remove the metal brace.

8. Remove the fan and replace.

2.3 Fan Module

2.3.1 Fan Module Installation

In this section, you will be shown how to install the Fan Module.

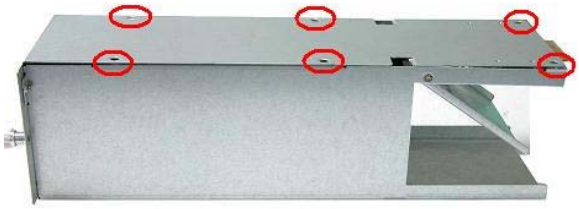
a. Check the fan module for any damage.

b. Carefully insert the fan module in its appropriate slot.

c. Tighten the thumb screws to secure the Fan Module to the enclosure.

2.3.2 Fan Replacement

1. Remove the fan module from the enclosure.
2. Unscrew 6 screws from top cover of fan module.



3. Unscrew 2 screws from both sides. Then remove the small metal plate.

4. Unscrew 2 screws from the inner fan.

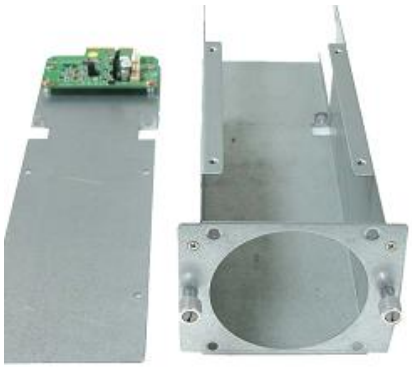
5. Carefully lift the top cover.

6. Remove 2 screws from the inner fan.

7. Unscrew the 4 screws of the outer fan. Then remove the metal brace.

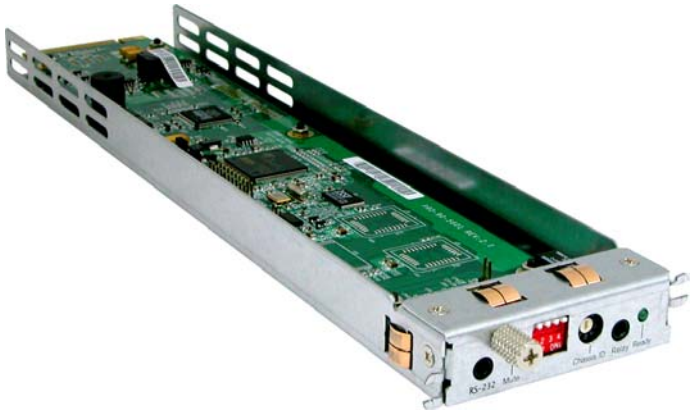
8. Disconnect the 2 fan cables.

9. Remove the fans and replace.



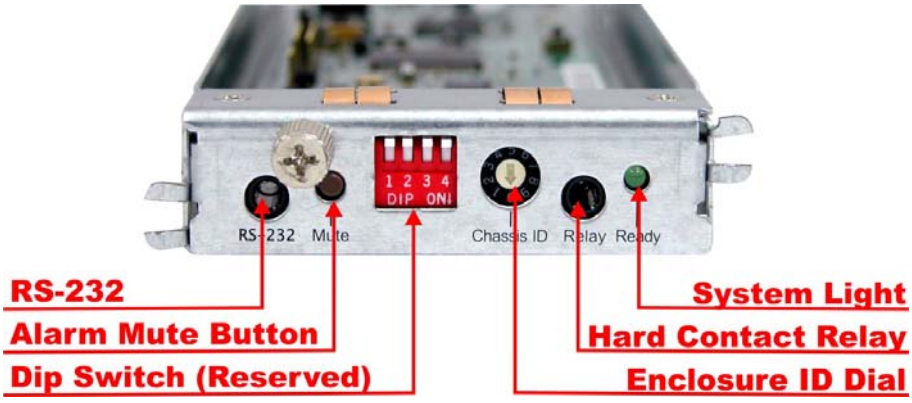
2.4 SCSI Enclosure Services (SES) Module

SCSI Enclosure Services (SES) is the protocol used for enclosure environmental control.



The SES module monitors the following enclosure conditions: temperature, power supply voltage, and fan speed. If any of the conditions above are not within specified parameters, the SES module will notify the user through email, SMS and/or an audible alarm. The SES module has the ability to regulate enclosure temperature by activating the Airflow Redirector in case of a power supply module failure.

2.4.1 SES Module Panel



2.4.2 Features of the SES Module

The SES Module consists of 6 features: RS-232 Port, Alarm Mute Button, Dip Switch, Enclosure ID dial, a Hard Contact Relay, and a System Light. These features are described as follows:

1. **RS-232 Port**
   The RS-232 port is for SES firmware upgrade.

NOTE: There are two types of SES board: PRO-90-5601 and PRO-90-6601. Each has different Baud Rate setting. The LCD Display Panel will show "SES" for PRO-90-6601 and "SES2" for PRO-90-5601.

Below are the RS-232 settings.

Settings	
Baud Rate	38400 (PRO-90-6601) 115200 (PRO-90-5601)
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

2. **Alarm Mute Button**
   When the audible alarm is sounding, press this button to mute the audible alarm.

3. **Enclosure ID Dial**
   The Enclosure ID Dial is used to indicate the ID number of that particular enclosure.

Enclosure ID	Disk ID Range	Used For
0	1 - 42	1st RAID Enclosure
1	43 - 84	Expansion (JBOD)

4. **Hard Contact Relay**

5. **System Light**
   a. The System Light is used to indicate whether the SES Module is on and whether or not there is an error.
   b. A **blinking GREEN** light indicates that the SES Module is **ON** and functioning normally.
   c. A **steady GREEN** light or **no** GREEN light indicates that there is an error with the SES Module.

2.4.3 SES Module LED

2.4.4 SES Module Installation

This section describes how to install the SES Module.

a. Check for damage, especially to the PCB Golden Fingers at the rear of the SES Module.

CAUTION! Handle the module with care and avoid damaging the Golden Fingers. In addition, make sure there are no fingerprints on the Golden Fingers. Do not install the module if the Golden Fingers are damaged.

b. Carefully insert the SES Module into the appropriate slot.

c. Use a screwdriver to tighten the 2 screws on either side of the SES Module and to secure the SES Module to the enclosure.

NOTE: The Thumbscrew is mainly used as a handle to remove the SES Module from the enclosure.

NOTE: All four DIP switches must be off.

2.4.5 SES Board Replacement

1. Unscrew the 2 screws on the upper and lower part of the SES module. Remove the SES module from the enclosure.

2. Unscrew 6 hex nut screws from the SES board.

3. Replace the SES board.

2.4.6 Upgrading SES Firmware

To upgrade the SES firmware, first you need to check SES board version number. Check in the LCD display the SES version (use arrow down key).

"SES2" means Version 2.x of PRO-90-5601 SES board
PRO-90-5601 Baud Rate Terminal Setting is 115200.

"SES" means Version 1.x of PRO-90-6601 SES board
PRO-90-6601 Baud Rate Terminal Setting is 38400.

Another option is to check the SES board version. Power off the RAID subsystem and remove the SES module. Check the board version from the label marked on the SES board.

PRO-90-5601 Ver: 2.x
Terminal Settings: 115200, 8, N, 1, N

PRO-90-6601 Ver: 1.x
Terminal Settings: 38400, 8, N, 1, N

The firmware upgrade process for each type of SES board is different.

For PRO-90-5601 SES board:

1. Connect RS232 serial cable to the RS232 port of SES module.

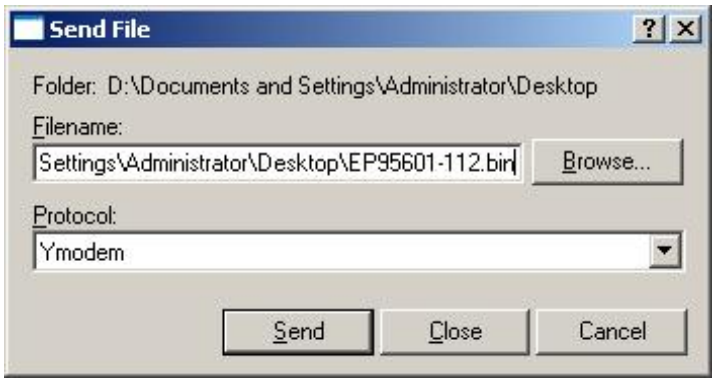
2. Configure terminal settings as follows:

Baud Rate:	**115200**
Data Bits:	**8**
Parity:	**None**
Stop Bits:	**1**
Flow Control:	**None**

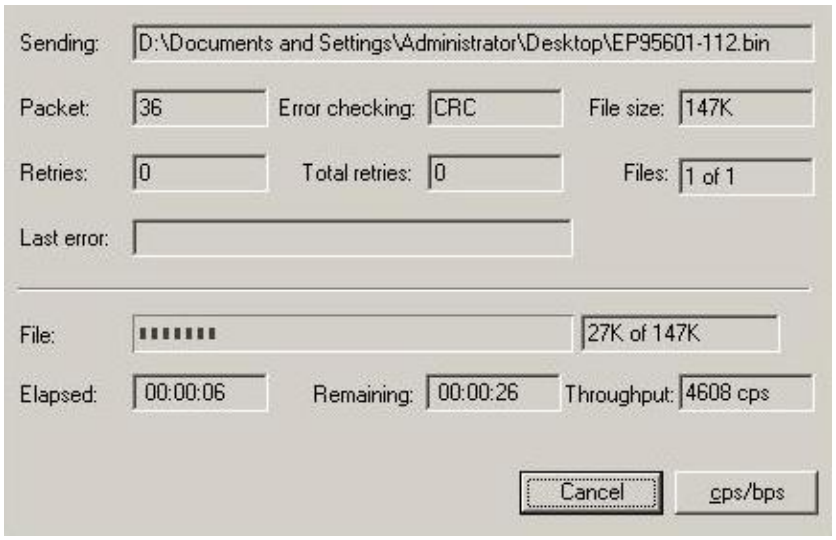
3. Open terminal console. Type "proses reset" then immediately press "Q"

```
--> proses reset
Disable I2C port_0 OK
Disable I2C port_1 OK
Software reseting...

=== Firmware Loader (V 1.0) (C) Copyright 2006 Proware ===

Press 'Q' to start firmware update process
Press 'X' to start FwLoader update process
5
Press 'Q' to start firmware update process
Press 'X' to start FwLoader update process
4_
```

4. Select "Transfer" then "Send File". Use "Ymodem" protocol. Select the SES firmware binary file. Click "Send" to start upgrade process.



5. Verify that the firmware upgrade is proceeding.



6. Check the message "Transfer Completed!" in terminal console. The controller will auto restart to load the update.

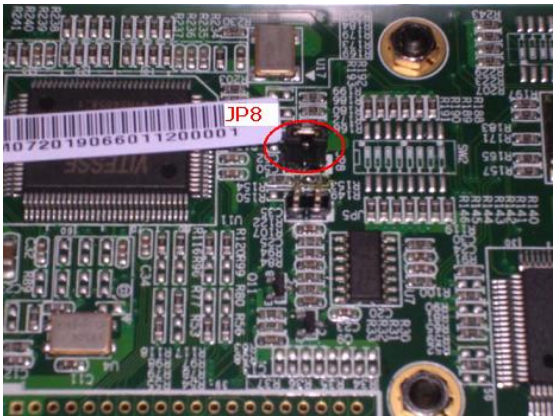
7. Use LCD panel to verify if the new SES firmware has been updated. Use arrow down key.

"SES2" means Version 2.x of PRO-90-5601
"V:1.12" is the SES firmware version.

For PRO-90-6601 SES board:

NOTE: The upgrade process is done twice. The first time needs a jumper in JP8. The second time does not need a jumper.

1. Power off the RAID system. Remove the SES Module. Insert a jumper in JP8 of SES board PRO-90-6601.

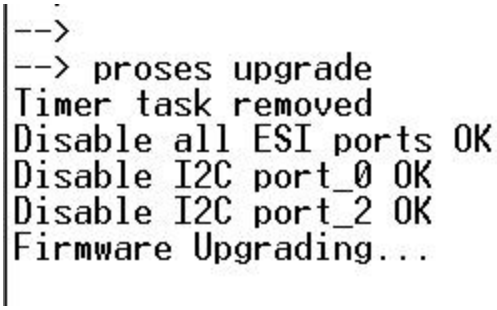


2. Insert the SES module into the RAID subsystem. Connect RS232 serial cable to the RS232 port of SES module.

3. Power on RAID subsystem. Configure terminal settings as follows:

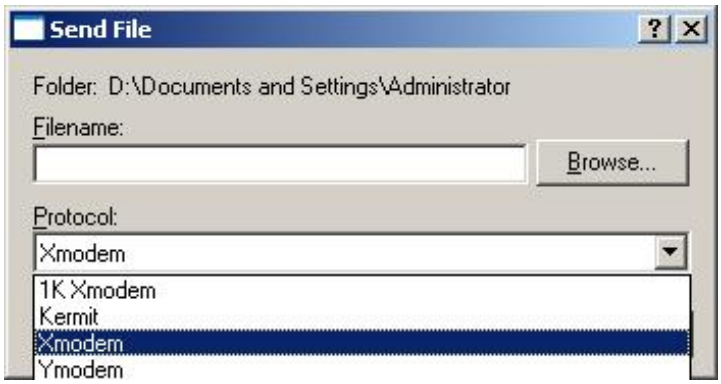
Baud Rate:	**38400**
Data Bits:	**8**
Parity:	**None**
Stop Bits:	**1**
Flow Control:	**None**

4. Open terminal console. Type "proses upgrade".

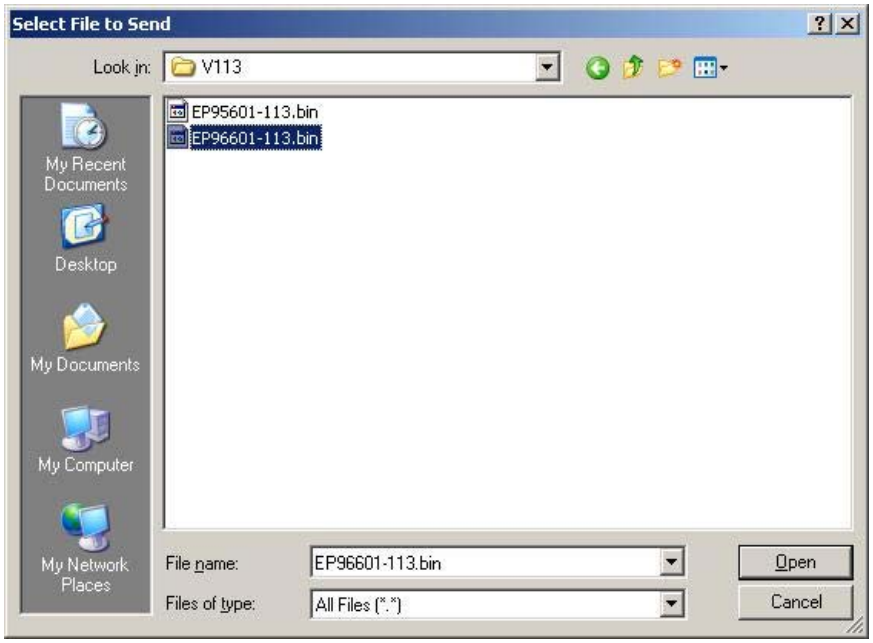


5. Select "Transfer" then "Send File".

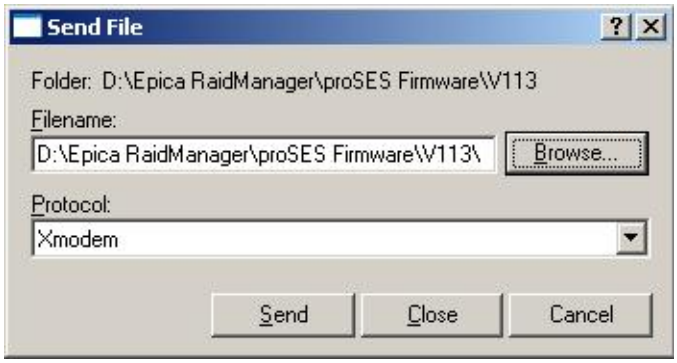
6. Select "Xmodem".



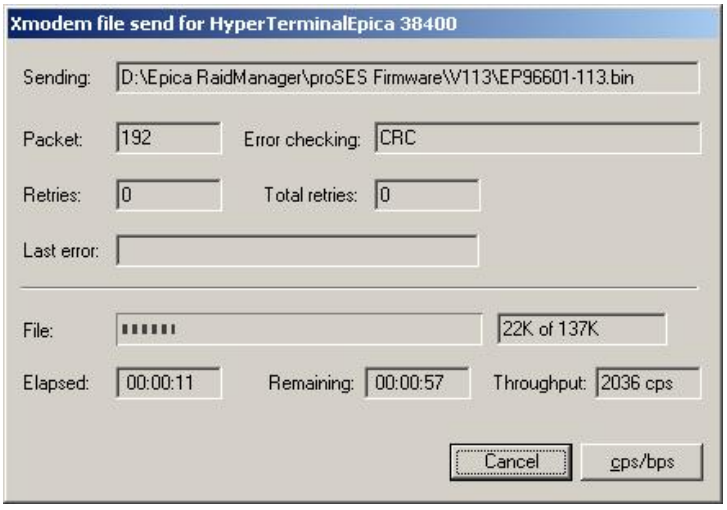
7. Select SES firmware binary file. Click "Open".



8. Click "Send" to start upgrade process.



9. The upgrade process will be shown.



10. Check if firmware upgrade is ok.

```
--> proses upgrade
Timer task removed
Disable all ESI ports OK
Disable I2C port_0 OK
Disable I2C port_2 OK
Firmware Upgrading...
CCCCFirmware Upgrade ok

-->
```

11. Power off RAID subsystem.

12. Remove the SES module. Remove the jumper in JP8. Reinsert SES module.

13. Repeat **Steps 2 to 11**.

14. Power on the RAID subsystem. Use LCD panel to check if the new SES firmware has been updated. Use arrow down key.

"SES" means Version 1.x of PRO-90-6601
"V:1.13" is the SES firmware version.

2.5 Base Plate Expander RS232 Module

The RS232 port is for Base Plate Expander firmware upgrade.

2.5.1 RS232 Module Panel

2.5.2 RS232 Module Installation

The RS-232 Module is inserted at the rear at the left side of the subsystem.

2.5.3 RS232 Board Replacement

1. Unscrew the two screws on the upper and lower part of the module. Remove the RS232 module from the enclosure.

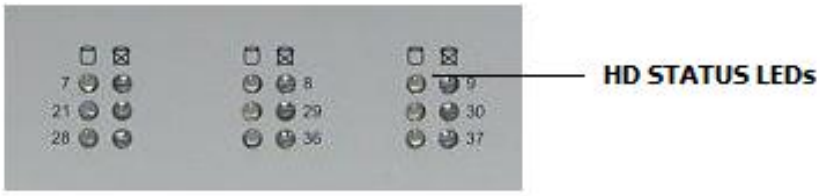
2. Unscrew 6 hex nut screws from the RS232 board.

3. Replace the RS232 board.

2.6 Drive Carrier Module

The Drive Carrier Module houses a 3.5 inch hard disk drive. It is designed for maximum airflow and incorporates a carrier locking mechanism to prevent unauthorized access to the HDD.

2.6.1 Disk Drive Status LEDs



HDD Status LEDs

Power On/Error LED: Green LED indicates power is on and hard drive status is good for this slot. If there is no hard drive, the LED is off. If hard drive is defective in this slot or the hard drive failed, the LED is red.

Access LED: Blue LED indicates that the hard drive is busy and is being accessed.

2.6.2 Disk Drive Installation

This section describes the physical locations of the hard drives supported by the subsystem and give instructions on installing a hard drive. The subsystem supports hot-swapping allowing you to install or replace a hard drive while the subsystem is running.

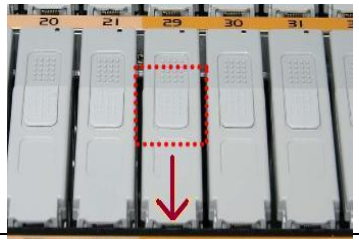
NOTE: It is not recommended to open the top cover for a long period of time; proper air flow within the enclosure might fail causing high disk drive temperature.

a. Unscrew two screws on both sides of the top cover on the front panel side.

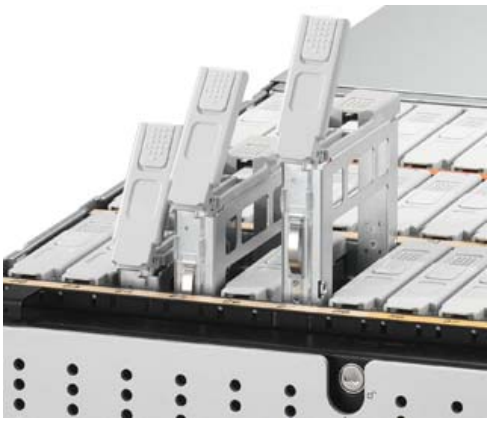
b. Slide the top cover about half an inch towards the front side then pull upwards to remove it.

c. Press the tray lock towards the front panel side to unlock it.

NOTE: An optional sticker can be pasted on the tray cover.



d. Draw the tray and hung on the bay. Pull out an empty disk tray.



e. Place the hard drive in the disk tray. Make sure the holes of the disk tray align with the holes of the hard drive.

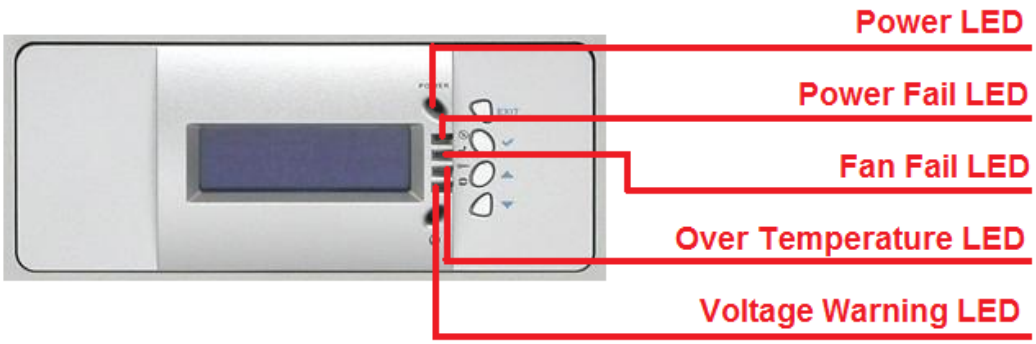
f. Install the mounting screws on the bottom part to secure the drive in the disk tray.

g. Slide the tray into a slot until it reaches a full stop.

h. Press the lever down until you hear the latch click into place. The HDD status LED will turn green on the front panel.

2.7 LCD Display Panel

2.7.1 LCD Display Panel LEDs



Environmental Status

Parts	Function
Power LED	Green indicates power is ON.
Power Fail LED	If one of the redundant power supply unit fail, this LED will turn to RED and alarm will sound.
Fan Fail LED	When a fan fails or a fan's rotation speed is lower than 1900rpm, this LED will turn red and an alarm will sound.
Over Temperature LED	If disk temperatures exceed 55°C the temperature LED will turn RED and alarm will sound.
Voltage Warning LED	When voltage levels in the system become abnormal (below or above threshold levels) an alarm will sound and this LED will turn red.

Function Keys for RAID Configuration

If you are configuring the subsystem using the LCD panel, please press the controller button to configure your RAID subsystem.

Parts	Function
Up and Down Arrow buttons ▲▼	Use the Up or Down arrow keys to go through the information on the LCD screen. This is also used to move between each menu when you configure the subsystem.
Select button ✔	This is used to enter the option you have selected.
Exit button EXIT	Press this button to return to the previous menu.

2.7.2 LCD Front Panel Function Menu

"EP-4429D-F4A3", stands for the model name of the enclosure. "Chassis ID:01" is the physical enclosure assigned identification number. A different chassis ID should be assigned if more than one enclosure is connected.

1. Firmware and proSES Menu

Press ▼ button:

The current proSES firmware version is 1.12. "SES ID: 01" is the physical enclosure assigned identification number.

Press ▲ or EXIT button will go back to the Main Menu.

Press ▼ will bring you to the next menu.

2. Disk Status Menu

Press ✔ button, the individual disk information will be displayed.

Press ▼ button:

This menu displays the disk temperature in each slot and which slots contain disks inserted.

ID: 001-042 means that the enclosure has a capacity of 42 disk slots. Press ✔ button to view the individual disk slot information. 's' represents disk slot, and 001-042 means slot number of the disk. *O* = means the disk is online and inserted on this slot, *X* = means the slot is empty. *F* = means the disk on that slots is FAILED.

'39 C' means the current temperature of the disk. The disk temperature has a threshold value of 55°C; if more than that, the temp LED will turn RED and buzzer will sound. Press ▲ button and ▼ button to view each 42 disk slots.

Press EXIT button will go back to the Disk Status Menu.

On the Disk Status Menu press ▼ button to proceed to the next menu.

3. Power Status Menu

Power Status Menu indicates the condition of the dual redundant power supply unit. "Good" means this power supply unit is healthy and "Failed" if it has problem.

Press ✔ button:

Press ▼ button:

Press EXIT button to return to the previous menu.

Press ▼ button will bring you to the next menu.

4. Fan Status Menu

Fan Status menu displays the health of the fans inside each power supply. The speed will depend on the enclosure's temperatures. The FAN speed is linear and it has deviation between 300rpm or 400rpm, if the proSES board detects high temperature it will change the speed.

To view the health of each fan press ✔ button:

Continue pressing the ▼ button will give you the linear speed of the rest of the fans.

Press EXIT button to return previous menu.
Press ▼ button will bring you to the next menu.

5. Voltage Status Menu

Voltage status menu, display the current voltage information.

To view the current voltage information press ✔ button:

Press ▼ button:

Valid voltage range:

+3.3V	< 2.97V	> 3.63V
+5V	< 4.5V	> 5.5V
+12V	< 10.8V	>13.2V

6. Buzzer Status Menu

Buzzer Status menu is used to disable/enable the proSES boards alarm. By default only the buzzer from the controller will alarm if enclosure has a problem. Default is 'Disabled'.

Press ▼ button will bring you to the next menu.

7. Controller IP Menu

This menu displays the Controller IP address.

Pressing the ▼ button will display the second controller's IP address.

In a single controller configuration, the second controller's IP address will be shown as 0.0.0.0.

NOTE: The LCD will display the IP address 2 minutes after power on, and subsequently refreshed every 15 minutes.
If the IP address is changed or reconfigured, the LCD will show the updated IP address within 15 minutes.

IMPORTANT!
ProSES board PRO-90-6601 will not show in the LCD the controller's IP address after upgrading the firmware to the web GUI version (controller FW 1.30, expander FW V389, and proSES FW 1.18).
If proSES board is PRO-90-5601, the LCD will display the controller's IP address after upgrade.
Refer to Appendix 1 for more information about the upgrade process.

2.7.3 LCD Display Panel Removal

To remove the LCD panel, follow these procedures:

1. The subsystem is provided with a key for security. Insert the key to the keyhole located at the upper centre of the front panel.

2. Rotate the key to the clockwise direction and pull it out.

3. Unlock the LCD panel screws located at center ends of the front panel.

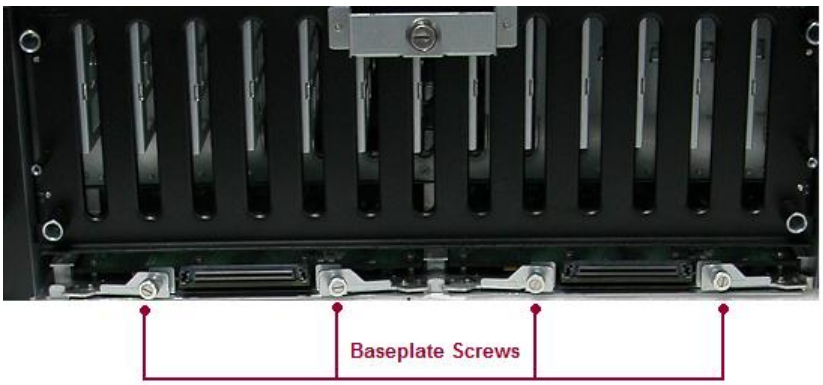
4. Remove the LCD panel.

2.8 Bottom Board (Base Plate)

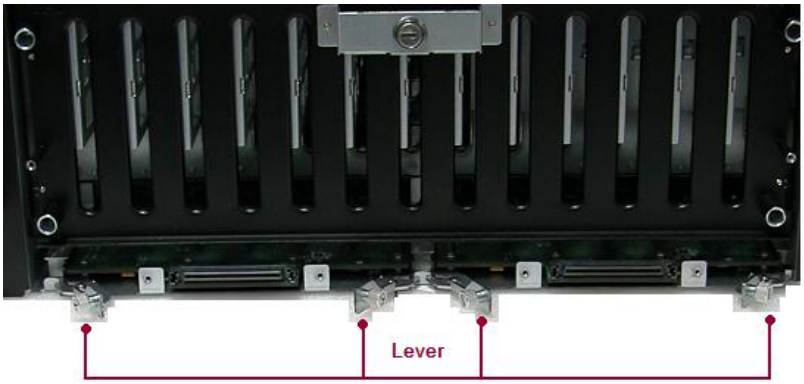
The subsystem has two bottom boards located at the bottom part of the chassis.

2.8.1 Bottom Board Removal

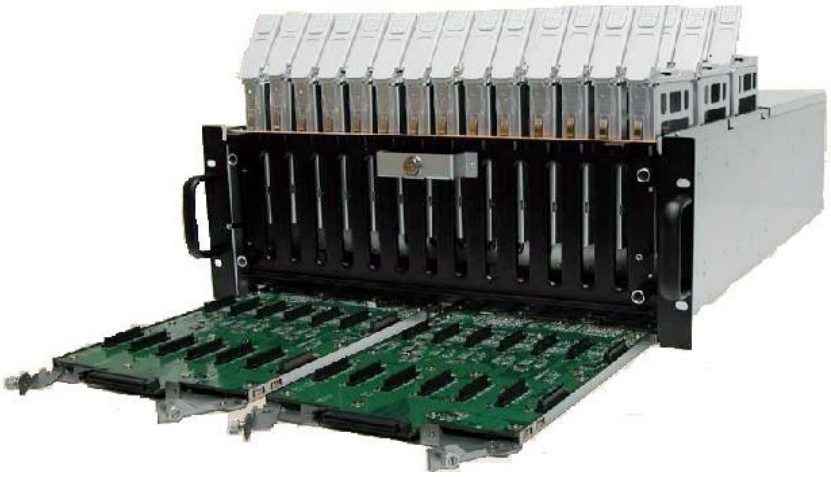
1. Remove first the top cover and hung all the disk trays. Remove the LCD Panel. Unlock the bottom board screws.



2. Then pull the lever.



3. Pull the base plates out.



2.8.2 Bottom Board Replacement

1. Remove the bottom board from the enclosure.

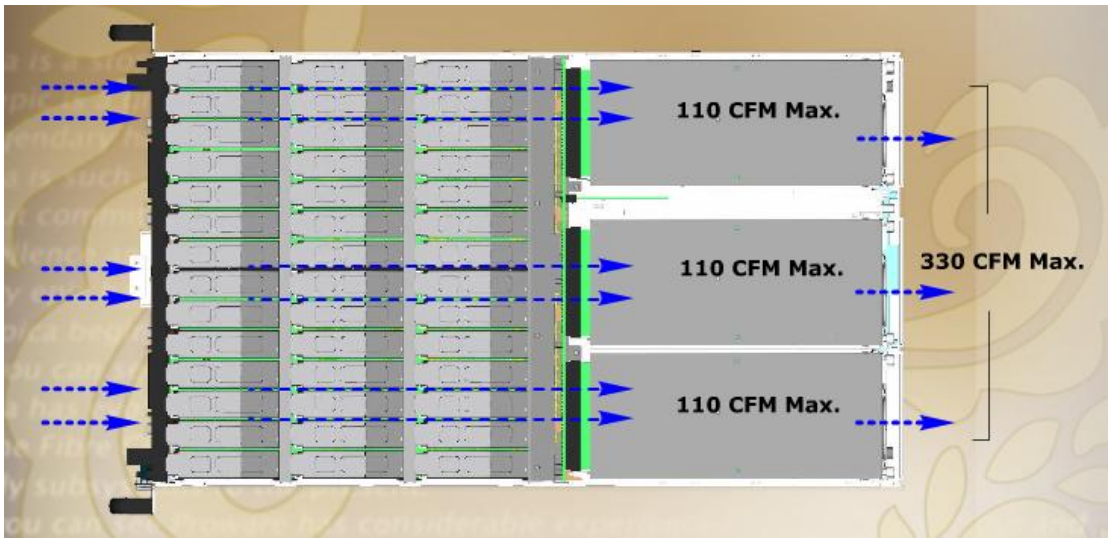
2. Unscrew 15 screws from the bottom board.

3. Replace the bottom board.

2.9 RAID Subsystem Airflow Direction

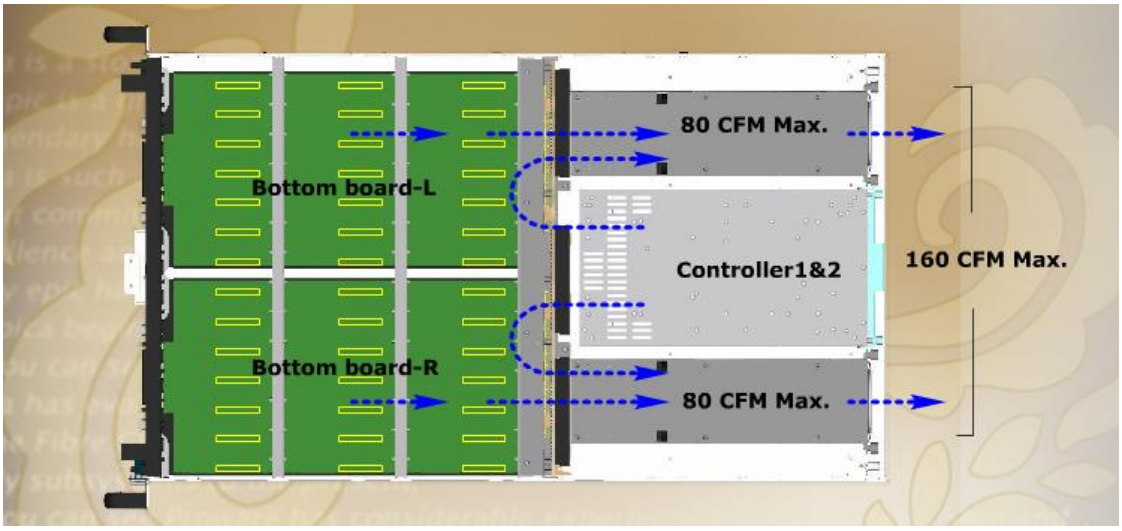
The RAID subsystem is equipped with 10 fans providing efficient airflow within the enclosure thus eliminating packets of heated air.

There are two fans in each power supply fan module. One fan provides 80 CFM and another fan provides 30 CFM for a total of **110 CFM** maximum. Three power supply fan modules provide a combined maximum airflow velocity of **330 CFM**.



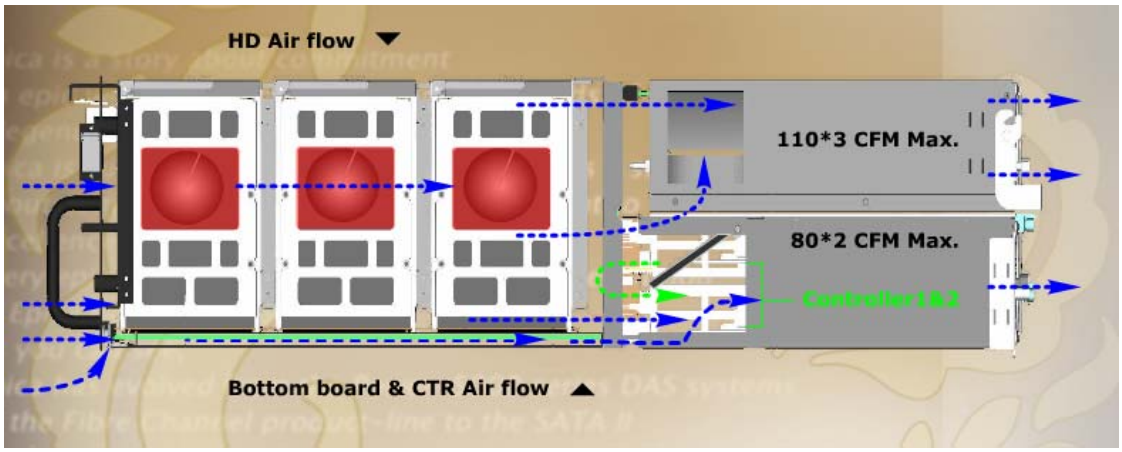
View from Top (Upper Portion of RAID Subsystem)

Two fans are also located in each fan module. Each fan module provides **80 CFM**. Two fan modules provide a total of **160 CFM** maximum.



View from Top (Lower Portion of RAID Subsystem)

The three power supply fan modules, which are located in the upper part of the enclosure, handle the airflow from the disk drives, while the two fan modules located at the lower part of the enclosure handle the airflow from the two controllers and from the bottom boards.



View from Side

Room air enters the holes of the front panel and goes through the disk drives (which are cooled down during the process) and goes out through the power supply fan modules. Room air also enters the air inlets in the lower portion of the front panel and passes through the bottom boards (which are cooled during the process) and exits through the fan modules.

2.10 Rackmount Slide Rail Installation

NOTE: At least two persons are needed to lift the RAID subsystem. To lighten the weight of the RAID subsystem, remove the disk drives from the slots if there are.

WARNING! It is prohibited to put other rack-mountable systems on top of the 42-bay RAID subsystem because the total weight will not be supported by the slide rails.

1. Remove the slide rails and other accessories from the box.

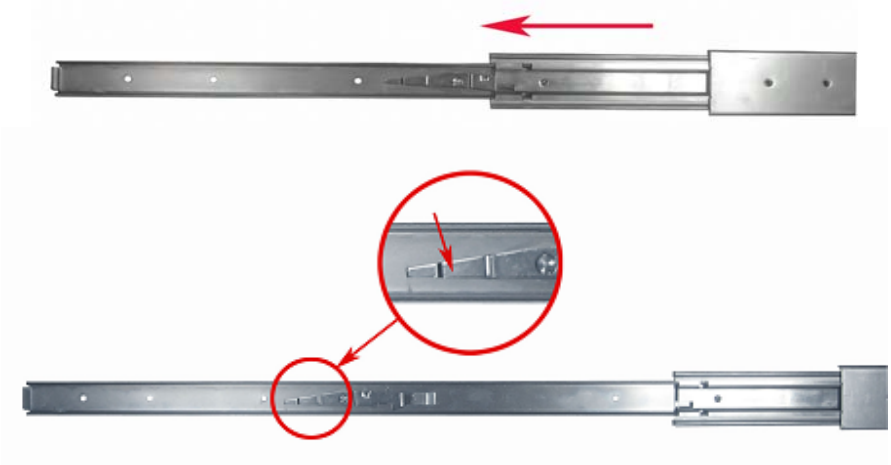
Slide rail assembly

L-bracket

Screws

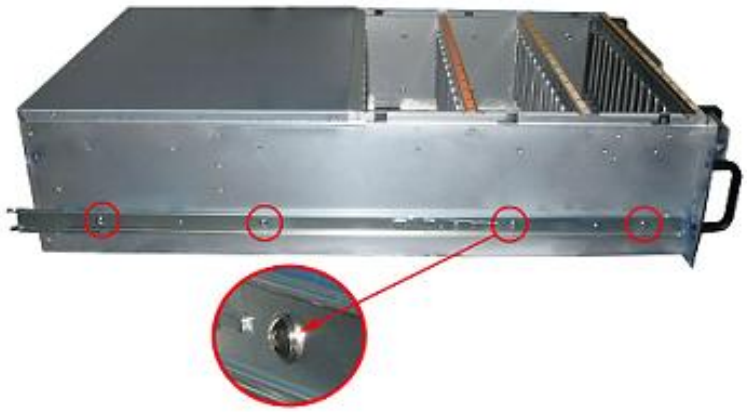
M4 Screw M5 Screw

2. Pull the inner rail from the slide rail assembly. To totally release the inner rail, press the lock downwards then pull the inner rail out.



3. Repeat step 2 for the other slide rail assembly (remove the inner rail).

4. Align the holes of the inner rail to the holes of the RAID subsystem and fix the inner rail to the side of the subsystem using four M4 screws with washers.



5. Repeat step 4. Fix the other inner rail on the other side of the subsystem.

6. Attach the L-bracket on the front side of the slide rail using three M4 screws.

7. Attach another L-bracket on the rear side of the same slide rail. Use three M4 screws. Loosely attach the M4 screws to allow the L-bracket to adjust to the depth of the rack.

8. Repeat steps 6 and 7 for the other slide rail.

9. To fix one slide rail into the rack, use two M5 screws to secure the front side of the slide rail to the rackmount cabinet.

Front Left Side of the Rackmount Cabinet

10. Adjust the L-bracket until it reaches the rear rack post then tighten the M4 screws connecting the L-bracket to the slide rail. Then fix the L-bracket (rear end of slide rail) to the rear side of the rack post using two M5 screws.

Rear Left Side of the Rackmount Cabinet

11. Repeat steps 9 and 10 for the other slide rail.

12. Insert the inner rails attached to the sides of the RAID subsystem onto the brackets of slide rails.

View from Rear

13. Push the lock of the inner rail attached on the left side of the subsystem in upward direction. At the same time, push also the lock of the inner rail on the right side of the subsystem in downward direction. Then push the RAID subsystem a few inches back into the cabinet.

View from Rear

14. Insert the disk trays / disk drives into the slots.

15. Put the top cover then secure it.

16. Push the RAID subsystem back into the cabinet until it reaches the rear end of the cabinet and comes to a stop.

17. Secure the RAID subsystem into the rackmount cabinet by tightening four M5 screws on the mounting holes in each corner of the front part of the subsystem.

2.11 Backup Battery Unit

An optional backup battery unit (BBU) can be installed in the RAID system. The BBU protects data in write caching mode by providing power to the RAID controller's cache memory.

2.11.1 Backup Battery Unit Installation

1. Check the BBU if battery packs are in good condition and cables are well connected.

2. Carefully insert the BBU into the appropriate slot of the RAID subsystem.

3. Verify in proRAID Manager -> Monitoring -> Enclosures -> Battery Backup Units if the battery pack(s) is/are detected.

4. Check the LEDs of the BBU.

   [1] LED for battery pack 1
   [2] LED for battery pack 2

   Charge/Full: If LED is Green, battery is 100% fully charged.
   If LED is Amber, battery is charging.

   Replace: IF LED is Red, battery cannot charge more than 80% of its capacity and need to be replaced.

2.11.2 Backup Battery Unit Replacement

1. Remove the Backup Battery Unit (BBU) from the RAID subsystem. If the module is secured to the chassis by screws, remove first the screws.

2. Loosen the screws on the BBU.

3. Disconnect the battery cables.

4. Replace the battery pack(s).
5. Insert the new battery pack(s) into the BBU.
6. Connect the battery cables.
7. Install BBU into the RAID subsystem.

2.12 Upgrading Controller Expander Firmware

NOTE: The Expander firmware upgrade procedure uses the same steps as the controller firmware upgrade except for the upgrade firmware file. Please refer to Administration chapter, Update Firmware section.

2.13 Upgrading Bottom Board (Base Plate) Expander Firmware

WARNING: Upgrading the bottom board expander firmware should be done under the direction of our technical support team.

NOTE: The Bottom Board Expander firmware upgrade procedure uses the same steps as the controller firmware upgrade except for the firmware file. Please refer to Administration chapter, Update Firmware section.

WARNING: Upgrading can take several minutes. It is recommended to stop all I/O processes. The bottom boards consist of 4 expanders and each expander takes around 4 minutes to upgrade in the background.

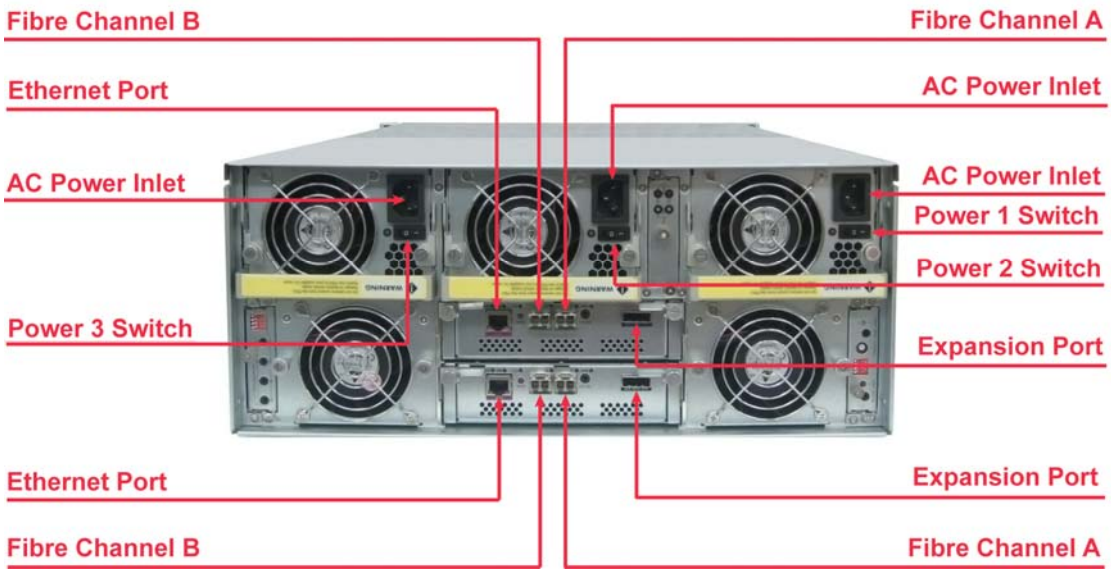
NOTE: Make sure that the expander slots 147, 148, 151 and 152 are shown in proRAID Manager Expanders table.

1. Login to your selected RAID subsystem and open proRAID Manager GUI. Select **Administration → Service Options → Controller Services → Upgrade Controller**.
2. Select "All Files" in File Type option, then click "**Browse**" and choose the firmware file (for example: EP914242-111.s3r).
3. Click "**Select**" to start the upgrade process.
4. Do **not** perform any other actions until a message is displayed confirming that the installation is finished.
5. If a system reset is needed to run the new firmware, you will be prompted to do so.
6. After upgrade process has been completed, verify the new expander firmware.

Chapter 3 Getting Started with the Subsystem

3.1 Connecting the RAID Subsystem

This section describes how to connect the EPICa RAID subsystem.



NOTE: For optimum performance, use 4Gb FC Host Bus Adapter(s) in the host computer(s).

1. Connect the three power cables to the AC Power inlets.
2. Connect the Ethernet cable(s) to the Controller's Ethernet port(s).
3. Connect the Fibre Cable(s) to the Fibre Channel Host Port(s). The other end(s) of Fibre Cable(s) are connected to your FC switch or HBA.
4. Turn on each power switch of the PSFM on the rear of the enclosure.
5. To power on the subsystem, turn on the main switch in the right corner side of front panel.

Main Switch

6. Allow the machine a few moments to initialize before using it.

Chapter 4 RAID Levels

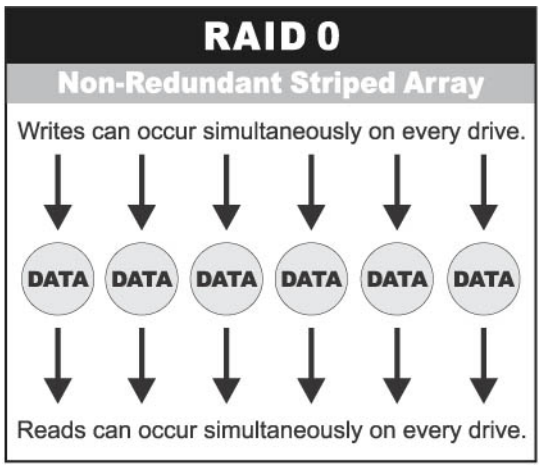
RAID stands for Redundant Array of Independent Disks. A RAID system consists of two or more disks in parallel. This array of disks appears as one disk drive to the host computer offering enhanced performance or data reliability or both.

There are different RAID Levels with each level being suited to a particular application. For example, RAID Level 1 uses mirroring to hold your data in 2 separate but identical locations. If a disk fails the RAID controller will use either the data disk(s) or the mirror disk(s) for data recovery giving you constant access to your data. This RAID Level is particularly suited to mission critical applications such as accounting systems.

The following is a brief list of the supported RAID levels.

RAID 0 - Striping without Fault Tolerance

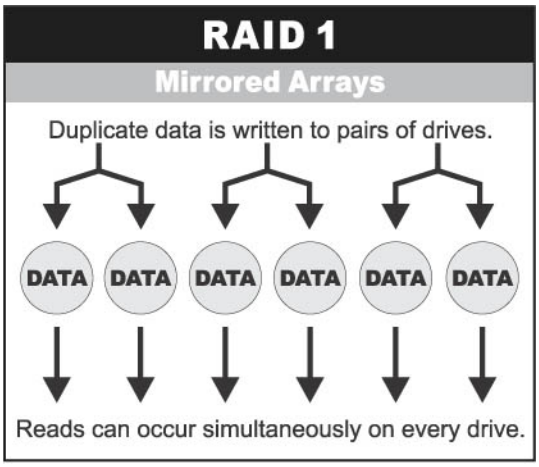
In a RAID 0 system the data is broken down in to equal blocks and each block is then written to a different disk in the RAID. The performance is excellent as the I/O load is shared equally between the all disks in the RAID. The following illustration shows a typical RAID 0.



Advantages	Disadvantages	Ideal Use
Good performance both in read and write operations as there is no overhead expended on parity controls. All storage capacity can be used; there is no disk overhead. Easy to implement.	Not fault-tolerant. If one disk fails, all data in the RAID 0 array are lost. Reliability is much less than a single disk - any media errors can cause data loss.	Not recommended for any mission-critical systems or applications

RAID 1 – Mirroring

In a RAID 1 system, the data is stored twice by writing it to both the data disk (or set of data disks) and a mirror disk (or set of disks). If a disk fails, the controller uses either the data drive(s) or the mirror drive(s) for data recovery and continues operation. You need at least 2 disks for a RAID 1 array. RAID 1 RAIDs give good fault tolerance but is more suited to applications where performance is not a critical factor. The following illustration shows a typical RAID 1.



Advantages	Disadvantages	Ideal Use
Excellent read speed and a write-speed that is comparable to that of a single disk. If a disk fails, data does not have to be rebuilt, it can simply be copied to the replacement disk. Very simple technology.	The main disadvantage is that the effective storage capacity is only half of the total disk capacity because all data gets written twice.	Ideal for mission critical storage, e.g. accounting systems. Suitable for small servers in which only two disks will be used.

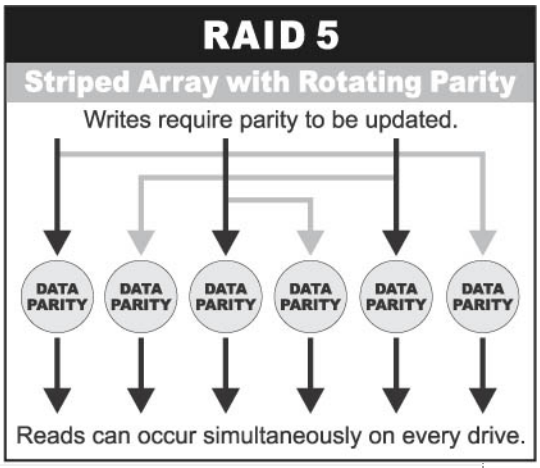
RAID 10 – A Stripe of Mirrors

A RAID 10 RAID combines both a RAID 0 and a RAID 1. Data is striped across multiple drives and these stripes are then mirrored on identical drives. This RAID level gives excellent read/write performance with good fault tolerant characteristics also. You need at least 4 disks to implement a RAID 10 RAID. The following illustration shows a typical RAID 10.

Advantages	Disadvantages	Ideal Use
High fault tolerance characteristics. Excellent performance through use of striped segments and load balancing across multiple drives	Very expensive to implement needing at least 4 disks. Not a very scalable solution.	Ideal for use in general file server applications. Can be used in high read/write applications such as image processing, editing, etc.

RAID 5 – Striping with Distributed Parity

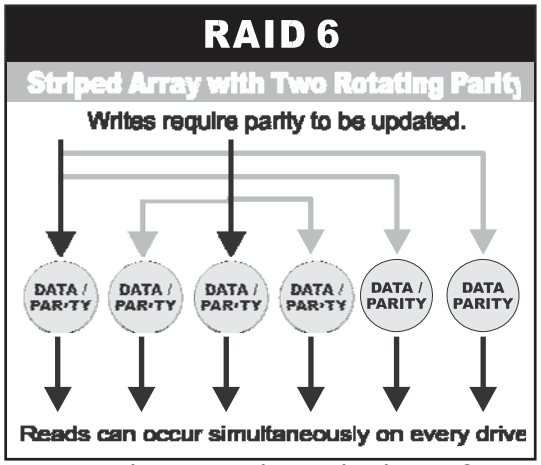
A RAID 5 RAID data is striped and transferred to disks by independent read/write operations. The data chunks that are written are also larger than in a RAID 0. The RAID 5 uses parity that is striped across all disks in the RAID. You need at least 3 disks to implement a RAID 5. A RAID 5 can withstand a single disk failure without loosing data or loosing access to the data. The following illustration shows a typical RAID 5 RAID.



Advantages	Disadvantages	Ideal Use
Read data transactions are very fast.	Write data transactions are somewhat slower (due to the parity that has to be calculated) Disk failures have an effect on throughput, although this is still acceptable.	A good all-round system that combines efficient storage with excellent security and decent performance. Ideal for file and application servers.

RAID 6 – Striping with Dual Distributed Parity

The RAID subsystem's RAID 6 function provides the highest level of data protection by tolerating multiple simultaneous drive failures without downtime or data loss. RAID 6 probability of data loss is 1/1,000 (three orders of magnitude) less that of an equivalent RAID 5 array.


RAID 6
Striped Array with Two Rotating Parity
Writes require parity to be updated.
DATA / PARITY
DATA PARITY
Reads can occur simultaneously on every drive

Where RAID 5 writes one parity block for each stripe across the array, RAID 6 saves two parity blocks, allowing the RAID controller to continue operating with two inoperative drives, without the loss of data or availability. As drive sizes have increased, the time required to rebuild an inoperative drive's data has stretched to several hours. During a rebuild, data on the remaining drives within a RAID 5 array is unprotected. Should a second drive fail, the rebuild will halt, and the entire RAID data may be lost. Because RAID 6 can tolerate two simultaneous drive failures, your data remains fully protected during the rebuild process. RAID set verification may be run ad-hoc or scheduled to test every sector for proactive error detection. Furthermore, the system constantly monitors drive health to proactively predict failure, and to automatically copy data to a spare drive before the drive fails.

Chapter 5 ProRAID Manager

The RAID subsystem is managed through the controller's Ethernet connection. Any PC on the network to which the RAID subsystem is connected can manage the subsystem using proRAID Manager. proRAID Manager is web-based GUI that is supported on many OS platforms.

This chapter describes the steps that you need to take to get ProRAID Manager up and how to use it on your system.

NOTE: To search for IP of RAID systems connected to the network using java-based proRAID Manager Version 1.5.37 or later, please refer to Appendix 2.

5.1 Connecting with proRAID Manager

By default, DHCP is enabled on the RAID subsystem and therefore no further configuration is needed.

There are three ways to connect with proRAID Manager.

a. Connecting with ProRAID Manager using DHCP
b. Connecting with ProRAID Manager using Static IP
c. Connecting with ProRAID Manager using APIPA

NOTE: The RAID controller's IP address can be seen from the LCD display panel. Press the ▼ button several times until you see the Controller IP menu.

5.1.1 Pre-setting a Static IP Using Serial Port

You can also connect directly to the RAID controller via the RS232 Serial Port on the controller. Using a terminal emulation program such as 'HyperTerminal' you can hard set the controller IP address.

Connect phone-jack-to-DB9 serial cable to the controller's RS232 port and to your computer's COM port. Then start terminal session with settings as follows: Bits per second: 115200, Data bits: 8, Parity: None, Stop bits: 1, and Flow Control: None. After connecting, login as "netadmin" without password. The screen will show the current IP setting. To assign static IP, type "set ip <ip_address> <net_mask> <gateway>".

```
login: netadmin

   ************Current ip setting*********
   Dynamic Ip address
   netmask   ::: 255.255.0.0
   inet addr ::: 169.254.2.135
   gateway   ::: 0.0.0.0
   dns1      :::
   dns2      :::
   domain    :::
   *****************  end   **************

  -------------- Commands Available ------------
       set ip <ip_address>
       set ip <ip_address> <net_mask>
       set ip <ip_address> <net_mask><gateway>
       set ip dynamic          /*Enable dhcp*/
       show ip                 /*List ip settings*/
       menu                    /*List available commands*/
       exit                    /*Exit netadmin*/
  --------------        end        ------------

please enter a command
```

5.1.2 Connecting with proRAID Manager Using DHCP

DHCP stands for Dynamic Host Configuration Protocol. It is a protocol used by networked devices to obtain various parameters necessary for the clients to operate in an Internet Protocol (IP) network. By using this protocol, system administration workload greatly decreases, and devices can be added to the network with minimal or no manual configurations therefore less effort.

By default, DHCP is enabled on the controller(s) and therefore no further configuration is needed.

Once the RAID subsystem obtains the dynamic IP address from DHCP server, use the IP address in your web browser to open proRAID Manager.

5.1.3 Connecting with proRAID Manager Using Static IP

If the RAID controller is assigned with static IP, use the static IP address in your web browser to open proRAID Manager.

You can also set the static IP using terminal emulation program (refer to Section 5.1.1).

NOTE: When using Static IP address, it is necessary to configure the network adapter on the computer that will be used to manage the RAID subsystem to the same subnet.

5.1.4 Connecting with proRAID Manager Using APIPA

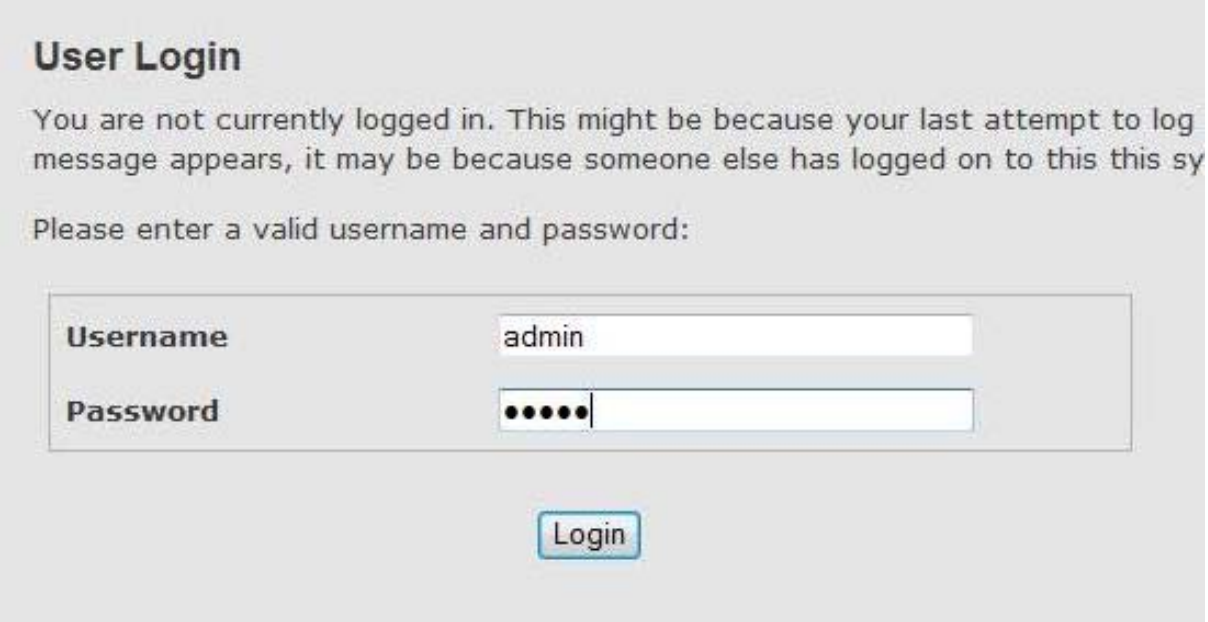
Automatic Private IP Addressing (APIPA) is a feature that automatically assigns an Internet Protocol address to a computer on which it installed. This occurs when the TCP/IP protocol is installed, set to obtain its IP address automatically from a Dynamic Host Configuration Protocol server, and when there is no DHCP server present or the DHCP server is not available. The Internet Assigned Numbers Authority (IANA) has reserved private IP addresses in the range of **169.254.0.0 - 169.254.255.255** for Automatic Private IP Addressing.

By default the system is configured to use DHCP. If no static IP address has been previously assigned and DHCP is enabled but DHCP server is not available, the RAID system will use an APIPA IP address. Use the APIPA-assigned IP address in your web browser to open proRAID Manager.

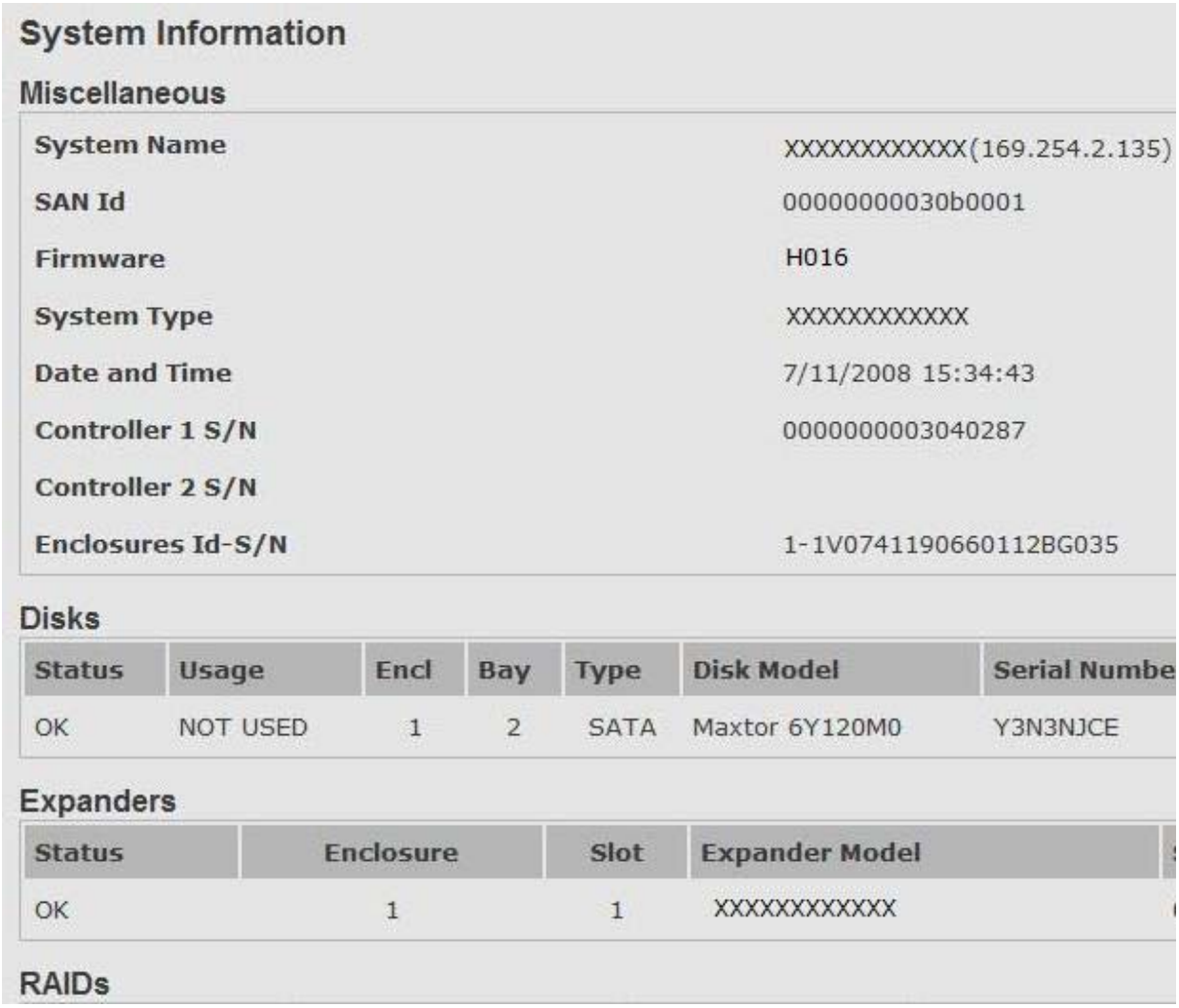
NOTE: When using APIPA-assigned IP address, it is necessary to configure the network adapter on the computer that will be used to manage the RAID subsystem to the same subnet.

5.2 Login to proRAID Manager

To connect to the desired RAID subsystem, you must enter a valid 'Username' and 'Password'. The fixed administrator username is **'admin'** and the default administrator password is **'admin'**. You can change later the administrator password in Administration -> Change Password.


User Login
You are not currently logged in. This might be because your last attempt to log
message appears, it may be because someone else has logged on to this this sy
Please enter a valid username and password:
Username
admin
Password
Login

The System Information screen will be displayed after login.



System Information

Miscellaneous

System Name	XXXXXXXXXXX(169.254.2.135)
SAN Id	00000000030b0001
Firmware	H016
System Type	XXXXXXXXXXX
Date and Time	7/11/2008 15:34:43
Controller 1 S/N	0000000003040287
Controller 2 S/N	
Enclosures Id-S/N	1-1V0741190660112BG035

Disks

Status	Usage	Encl	Bay	Type	Disk Model	Serial Numbe
OK	NOT USED	1	2	SATA	Maxtor 6Y120M0	Y3N3NJCE

Expanders

Status	Enclosure	Slot	Expander Model
OK	1	1	XXXXXXXXXXX

RAIDs

NOTE: The System Information screen can also be accessed in the Information ➔ System Information menu.

The following table gives an explanation of each option available on the System Information screen:

Miscellaneous

Field	Description
System Name	The name of the system being managed by ProRAID Manager.
SAN ID	Unique ID for identifying the configuration of the system.
Firmware	Revision of firmware on the controller.
System Type	The system model being managed by ProRAID Manager.
Date and Time	Current date and time settings on the system.
Controller 1	Serial number of controller 1.
Controller 2	Serial number of controller 2.
Enclosure ID - S/N	The enclosure ID number and serial number of the enclosure.

Disks

Field	Description
Status	Displays the disk status, may be OK, critical, non-critical, unrecoverable and unsupported.
Usage	Displays how the disk is used, it may be part of a RAID, local spare, global spare or not used.
Enclosure	The ID of the enclosure that the disk is located in.
Bay	Bay in the enclosure where the disk is located.
Type	Shows the type of disk, such as SATA.
Disk Model	Model number of the disk.
Serial Number	Manufacturer's unique serial number on the disk.
Firmware	Revision of firmware on the disk.
Capacity (GB)	Capacity in Gigabytes of the disk.
Errors	Shows the total number of disk errors for each disk.

Expanders

Field	Description
Status	Displays the expander status, may be OK, critical, non-critical, unrecoverable and unsupported.
Enclosure	The ID of the enclosure where the expander is located in.
Slot	Slot in the enclosure where the expander is located in.
Expander Model	Model number of the expander.
Serial Number	Manufacturer's unique serial number of the expander.
Firmware	Version of firmware on the expander.

RAIDs

Field	Description
Name	The name of the RAID
Profile	Defines the general operating or application environment in which the RAID will be used (e.g. one RAID volume might be optimized for database applications while another might be optimized for file server applications). This is configured when the RAID is created.
State	The states available for RAIDs are: • Good • Degraded • Rebuilding • Initializing • Expanding • Verifying • Inaccessible If the RAID is Rebuilding, Initializing, Expanding or Verifying, the progress of the task will be displayed in brackets, e.g. 'Initializing (75%)'.
Level	The RAID level selected when the RAID was created. The current options available are RAID levels 0, 1, 5, 6 and 10. A RAID 10 will be displayed as a RAID 1.
Capacity	Capacity in Gigabytes of the RAID.

Logical Volumes

Field	Description
Logical Volume	The name of the Logical Volume.
Serial Number	The Logical Volume Serial Number assigned by the system.
Capacity (GB)	Capacity in Gigabytes of the Logical Volume.
Status	Shows the Logical Volume Status, such as Global or Private.
RAID	The name of the RAID on which the Logical Volume was created.

Hosts

Field	Description
Host Name	The name of the Host
Node Name	Node ID of the initiator.
Port Name	Port Name of the initiator.
Port 1A	The current Login status of the host to Port A of Controller 1. If the host is logged in to the controller port then the Address or ALPA will be displayed. In fabric and point-to-point modes, this field is referred to as Address. In loop mode this field contains the ALPA. It represents the ID of the host when connected to the SAN.
Port 1B	The current Login status of the host to Port B of Controller 1. If the host is logged in to the controller port then the Address or ALPA will be displayed. In fabric and point-to-point modes, this field is referred to as Address. In loop mode this field contains the ALPA. It represents the ID of the host when connected to the SAN.
Port 2A	The current Login status of the host to Port A of Controller 2. If the host is logged in to the controller port then the Address or ALPA will be displayed. In fabric and point-to-point modes, this field is referred to as Address. In loop mode this field contains the ALPA. It represents the ID of the host when connected to the SAN.
Port 2B	The current Login status of the host to Port B of Controller 2. If the host is logged in to the controller port then the Address or ALPA will be displayed. In fabric and point-to-point modes, this field is referred to as Address. In loop mode this field contains the ALPA. It represents the ID of the host when connected to the SAN.

5.3 ProRAID Manager GUI Hierarchy

Below is the summary of the menu and functions available in proRAID Manager GUI.

RAID Functions	**Create RAID Set**
	View RAID Set
	Modify/Delete RAID Set
	Expand RAID Set
	Rebuild RAID Set
	Verify RAID Set
	Create Hot Spare
	Delete Hot Spare
	View Hot Spares
	RAID Ownership
Logical Volume Functions	**View Logical Volumes**
	Create Logical Volume
	Modify/Delete Volume
	Host Mapping
Monitoring	**Enclosures**
	Disks
	Port Statistics
	Event Log
Administration	**Clear Event Log**
	Port Setup
	Ethernet Configuration
	Email Event Configuration
	SNMP Configuration
	Change Password
	Update Firmware
	Reset Controller
	Telnet
	Config Save/Restore
	Export Status
	System Name
	Set Date and Time
	Setup Wizard
Information	**System Information**
	About RAID Manager
Help	**RAID Management**
	Logical Volume Management
	Monitoring
	Administration
	Troubleshooting

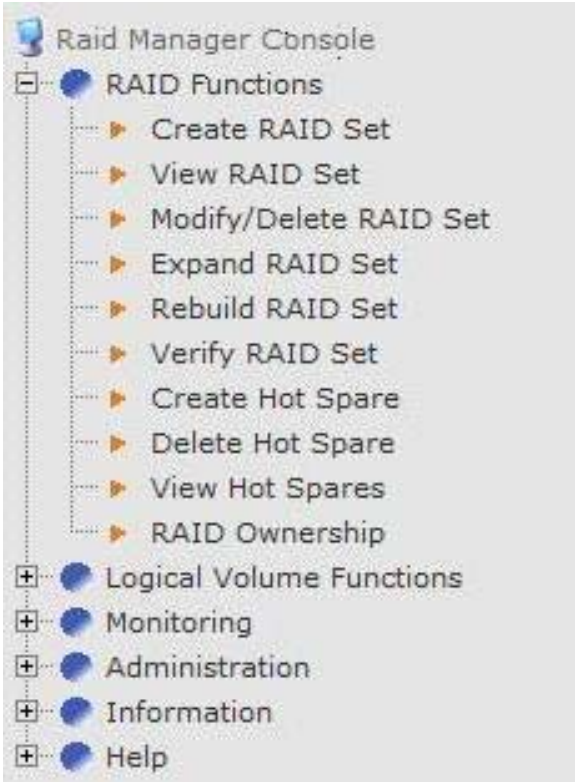
5.4 Screen Template

There is a common template used in all screens.

- The Epica logo is displayed in the top right corner.

- The proRAID Manager logo is displayed in the top left corner.

- There are three options below the proRAID Manager logo: open all, close all, and logout.
- Below the Raid Manager Console are the Main Menus. When a Main Menu is selected, its sub-menus are displayed.



- The Information / Configuration screen of the selected sub-menu is displayed in the right pane.

Chapter 6 RAID Management

This chapter describes the available RAID Management tasks; these tasks may be selected from the RAID Functions in the left frame of the proRAID Manager screen. The following RAID Management options are available:

- Create RAID Set
- View RAID Set
- Modify/Delete RAID Set
- Expand RAID Set
- Rebuild RAID Set
- Verify RAID Set
- Create Hot Spare
- Delete Hot Spare
- View Hot Spares
- RAID Ownership

6.1 About RAID

RAID stands for Redundant Array of Independent Disks. A RAID system consists of two or more disks in parallel. This array of disks appears as one disk drive to the host computer offering enhanced performance or data reliability or both.

There are different RAID Levels with each level being suited to a particular application. For example, RAID Level 1 uses mirroring to hold your data in 2 separate but identical locations. If a disk fails the RAID controller will use either the data disk(s) or the mirror disk(s) for data recovery giving you constant access to your data. This RAID Level is particularly suited to mission critical applications such as accounting systems.

6.1.1 RAID Considerations

When implementing a RAID system, there are a number of things you need to consider:

- ☑ How many disks are available for RAID?
- ☑ What RAID level is required?
- ☑ What Spare Drive strategy do you want to implement?

6.1.1.1 Number of Disks Available

The number of physical disks that are available will influence your decision about which RAID level you can choose and whether or not you can have a spare drive(s). The following table shows the minimum number of disks that are required to implement each RAID level.

RAID Level	Minimum Number of Disks
0	1
1	2
10	4
5	3
6	4

If you wish to have a Spare Drive, you will need to have at least the minimum number of disks, plus a disk for every Spare Drive you require.

NOTE: To create a RAID 10, select multiples of two disks and select RAID 1. The RAID Level will still show as "RAID 1" but the RAID capacity is correct.

6.1.1.2 Spare Drive Strategy

A Spare Drive is a disk drive that is set aside when creating your RAID system so that it can be used to rebuild a RAID in the event of a disk drive in that RAID failing. This reduces the risk to your data as the RAID can be rebuilt immediately without installing a new disk to replace a failed disk in the RAID.

When creating your RAID Set you must consider which Sparing Strategy you want to implement. There are 3 possible Sparing Strategies available in ProRAID Manager: None, Local, and Global.

A **Local Spare Drive** is a spare disk that is only available to the RAID Set in which it was created. If a disk fails in a RAID Set in the system, a Local Spare from another RAID Set cannot be used to rebuild the degraded RAID Set.

A **Global Spare Drive** is a spare disk that is available to all RAID Sets in the system. If a disk fails in any RAID Set in the system, the Global Spare disk can be used to rebuild the degraded RAID Set.

NOTE: A Spare Disk must have capacity equal to or greater than the capacity of the disks in the RAID Set(s) to which it is assigned.

6.1.2 RAID Caching

The Raid controller comes with a cache memory, 512MB, 1GB or 2GB cache size. The cache memory is used for both reading and writing data. There are several kinds of caching implemented by the system firmware:

- Read Cached Data
- Streaming Read Data
- Write Cached Data
- Disk Caching
- Disable Sync Cache Command

6.1.2.1 Read Cache Data

The system records the number of read and write commands that occur in the same physical stripe. When the number of commands exceeds a preset threshold, the system will allocate storage space to cache this data. This increases performance because subsequent read operations can be serviced from memory instead of reading from the disk.

6.1.2.2 Streaming Read Data

The system records the starting block and block size of each command received. When the start block of a new command matches the last block of a previous command the system detects that there is a stream of commands in progress and pre-fetches data up to 16 times the size of the original command. This increases performance by lowering the latency of subsequent commands in the stream.

6.1.2.3 Write Cache Data

When write caching is enabled, performance is increased in two ways. Firstly it lowers command latency to the host. Secondly, by coalescing contiguous write data into larger segments before it is written to disk, seeks are reduced and bandwidths increased.

If you do not have a BBU or UPS installed, you must carefully consider whether you want to implement Write Caching. If power is lost to the system with Write Cache enabled you will loose the data stored in the Cache memory. Therefore, you must decide whether the advantages of Write Caching exceed the risks involved.

NOTE: If write caching is enabled, and the system is not protected by a built-in BBU or an external UPS, data may be lost if there is an AC power failure or the AC power is turned off prior to the cache being written to disk.

NOTE: Use Cache Mirror option to achieve cache coherency when operating dual controllers in Active:Active configurations.

6.1.2.4 Disk Caching

The system supports disk caching, which will improve performance once enabled. Disk caching is enabled by default.

6.1.2.5 Disable Sync Cache Command

With Write Caching enabled for an array volume or standalone disk, the OS provides for the 'synchronize cache' command when initiating shutdown, where the cached data is written to the hard disk(s) before the computer shuts down.

Certain Host OS platforms require that the target array volume or standalone drive does not support 'synchronize cache' commands.

The system provides an option where the 'synchronize cache' commands can be enabled or disabled as required.

By default, the 'synchronize cache' command is enabled.

The 'synchronize cache' command can be enabled/disabled in the following way:

1) Using the Monitor command line

To disable the 'synchronize cache' command (scsi command 0x35 0x91) enter:

"set config scsi_control 0x40"

To enable the 'synchronize cache' command enter:

"set config scsi_control 0x0"

6.1.3 RAID Profile Usage

The RAID profile allows you to optimize your RAID system so that it best suites the application for which it is to be used. The following table shows the RAID profiles that are available and explains each option:

Profile	Description	Read Cache	Write Cache	Stripe Unit Size ***	Expected Sequential / Random Mix	Expected Read / Write Mix
Workstation / CAD	For general desktop applications	Read & Read Ahead	On	128	70% Sequential 30% Random	70% Read 30% Write
File Server	For file server and network storage	Read & Read Ahead	On	256	50 % Sequential 50% Random	70% Read 30% Write
Media Server	For video and creative content storage	Read Ahead	On	256	90% Sequential 10 % Random	50% Read 50% Write
Database	For transaction processing	Read	On	64	10 % Sequential 90 % Random	90% Read 10% Write
**Media Server - No init ** **	For video and creative content storage	Read Ahead	On	256	90% Sequential 10 % Random	50% Read 50% Write

When a RAID is created, the profile determines the default caching parameters (which can be changed after RAID creation) and the stripe unit size (which cannot be changed after RAID creation).

The default profile when the system is shipped is 'File Server'.

** A RAID with a profile of 'Media Server - No init' is not initialised and is immediately available. Small writes will incur a small penalty.

*** measured in sectors

RAID is traditionally used on servers, but can be also used on workstations. The latter was once common in storage-intensive applications such as video and audio editing, but has become less advantageous with the advent of large, fast, and inexpensive hard drives based on perpendicular recording technology.

Workstation / CAD

The term "workstation" has also been used to refer to a terminal or PC hooked up to network. Workstations are often optimized for displaying and manipulating complex data such as 3D mechanical design, engineering simulation results, animation and rendering of images, and mathematical plots.

File Server

RAID might be optimized as a File Server that has the primary purpose of providing a location for the shared storage of information (such as documents, sound files, photographs, movies, images, databases, etc.) that can be accessed by the workstations that are attached to the network. A File Server is designed primarily to enable the rapid storage and retrieval of data where the heavy computation is provided by the workstations.

Media Server

While on some, RAID can be optimized as media server that range from an enterprise class machine providing video on demand, to more commonly, a small home computer storing various digital media.

Database

RAID also has a great usage in transaction processing. Database is the well known structured collection of data and related information that is organized so that it can easily be accessed, managed, and updated.

6.1.4 Auto Rebuild

The RAID subsystem has 3 rebuild options if a RAID becomes degraded. These are **disabled** , **ASAP** and **background** . These options can be set in the ProRAID Manager **RAID Functions ➔ Create RAID Set** screen and can be changed in **RAID Functions ➔ Modify/Delete RAID Set** screen. Background is the default setting. The RAID can still be accessed during a rebuild, but performance will be reduced.

NOTE: If a Verify is scheduled when a rebuild is in progress, the Verify will not take place.

6.1.4.1 Disabled

If Auto Rebuild is set to Disabled, the RAID will not rebuild unless you manually select Rebuild in the ProRAID Manager **RAID Functions ➔ Rebuild RAID Set** screen. If a RAID becomes degraded, an alert will still be generated even if Auto Rebuild is set to disabled.

6.1.4.2 ASAP

If Auto Rebuild is set to ASAP, the RAID will rebuild as quickly as possible while still allowing reading and writing to occur. Read and write performance may be substantially reduced from normal operation.

6.1.4.3 Background

If Auto Rebuild is set to Background, the RAID will rebuild, but priority will be given to normal read and write operations. If there is a high level of read and write activity, the rebuild may take a long time.

6.2 Creating a RAID

The RAID Create option brings you through the logical sequence of screens that enable you to create a RAID:

- **Select Disks**
- **Configure RAID Options**

6.2.1 Selecting the Disks

On the **RAID Functions ➔ Create RAID Set ➔ Disks** screen you can select the disks that you want to include in your RAID.

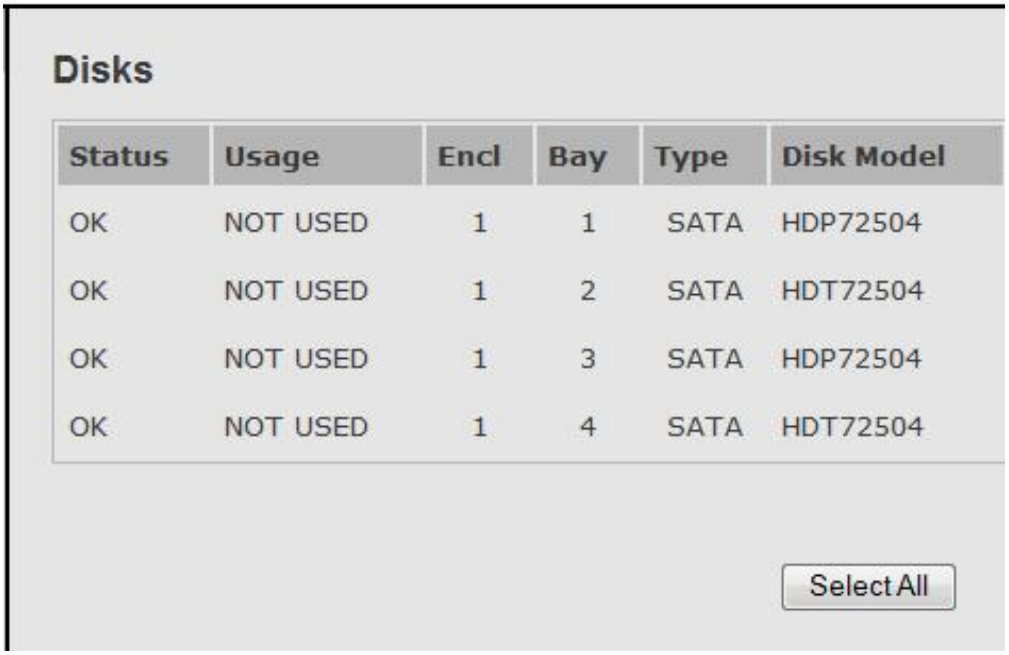
To include a single disk in a RAID, simply tick the check-box on the right hand-side of the table for the required disk.

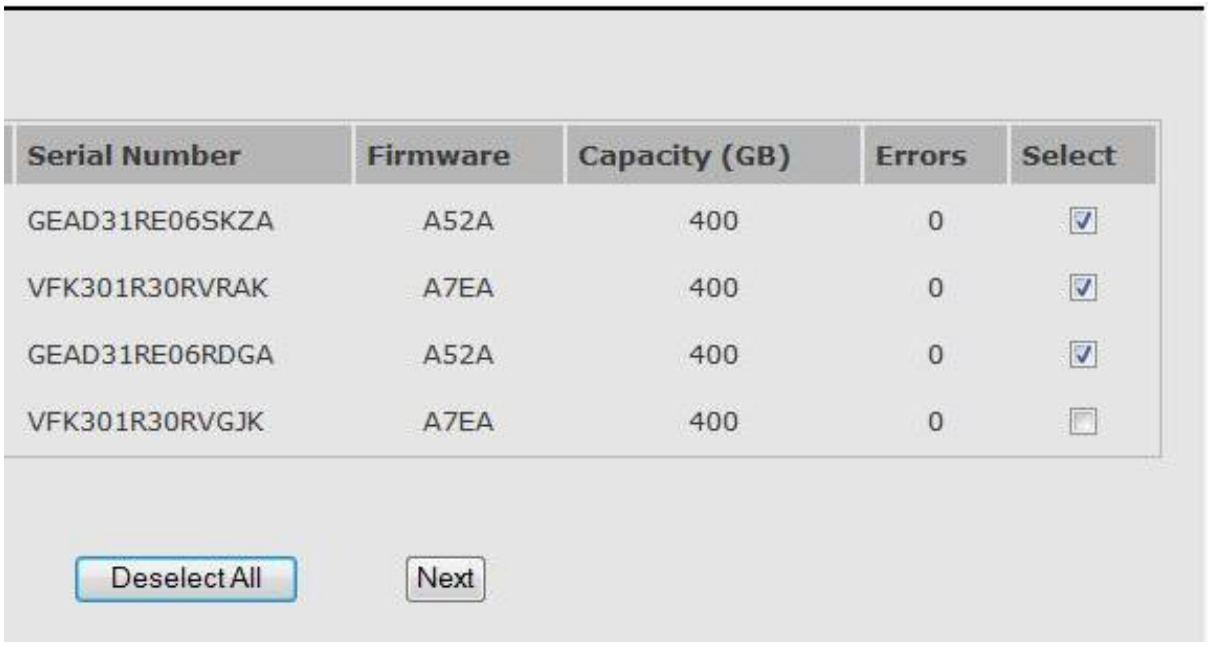
It is also possible to select all disks for a new RAID by pressing the **Select All** button.

If user wishes to deselect all disks, this can be achieved by pressing the **Deselect All** button.

Once disk selection has been completed, the user can navigate to the RAID Create screen by pressing **Next** button.

NOTE: You cannot have both SAS and SATA disk drives in the same enclosure.





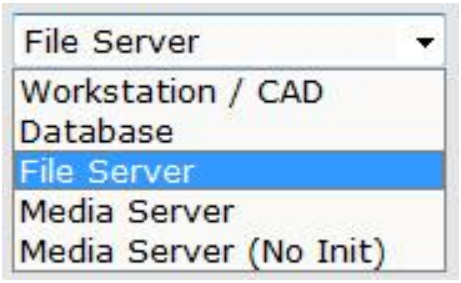
NOTE: When selecting disks for RAID creation, never display Missing, Faulty or Broken disks, regardless of whether they are part of a RAID or spares.

6.2.2 Configuring RAID Options

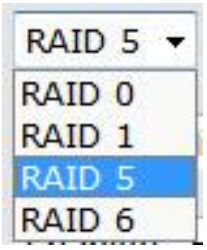
On this screen the user can configure a RAID using the drop down lists to select the relevant parameters that define the RAID.

Complete the following steps to configure the RAID options:

1. The 'RAID Profile' allows the controller to optimise the RAID and cache configuration based on the expected access pattern to the Logical Volumes on the RAID. Select the profile that best fits the application environment that the RAID will be used. The following are the available profiles (for more information on RAID Profiles, refer to Section about RAID Profile Usage):



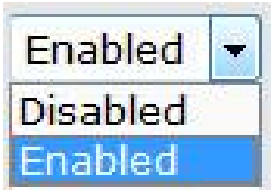
2. Select the RAID level to be created. Currently RAID levels 0, 1, 5, 6 and 10 are available.



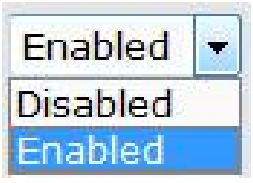
NOTE: To create a RAID 10, select multiples of two disks and select RAID 1. The RAID Level will still show as "RAID 1" but the RAID capacity is correct.

3. Enable 'Write Cache' if you want the controller to respond with Good status when the data is written to the cache, but before it is written to disk.

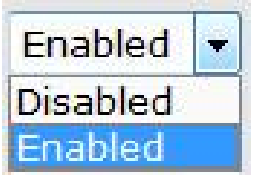
4. Enable 'Read Cache' if you want the controller to store the data most recently retrieved in the cache.



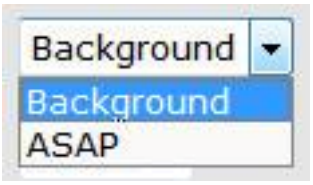
5. Enable 'Read Ahead' if you want the controller to optimize performance on sequential reads.



6. Enable 'Disk Caching' if you want the controller to enable disk caching.



7. Enable automatic rebuild if required. If enabled the RAID will be automatically rebuild if it becomes degraded (i.e. a disk fails), provided a spare is available. This option can either be Disabled, ASAP, or Background.



NOTE: The Auto Rebuild option is not available for RAID level 0.

NOTE: The performance of the system will slow down during a rebuild.

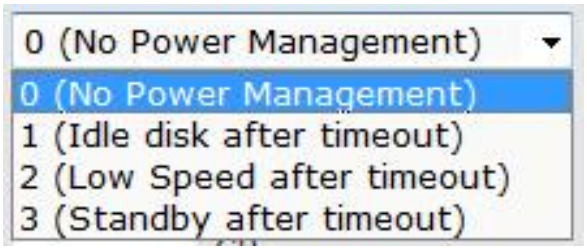
IMPORTANT: When rebuilding a RAID you should not remove the faulty disk until the rebuild is complete. If you must remove the disk then the data should be backed up prior to removing the disk.

8. Select from the following sparing strategies:

If local sparing is selected, one of the selected disks will be assigned as the local spare. If global sparing is selected and no global spare has been assigned (or the current global spare is too small), a warning message will be displayed. A disk that is assigned as a local spare can only be used by the RAID that it is assigned to. Refer to Spare Drive Strategy Section on creating spare disks.

9. Intelligent Power Management Configuration

   a. Select the MAID Level for the RAID

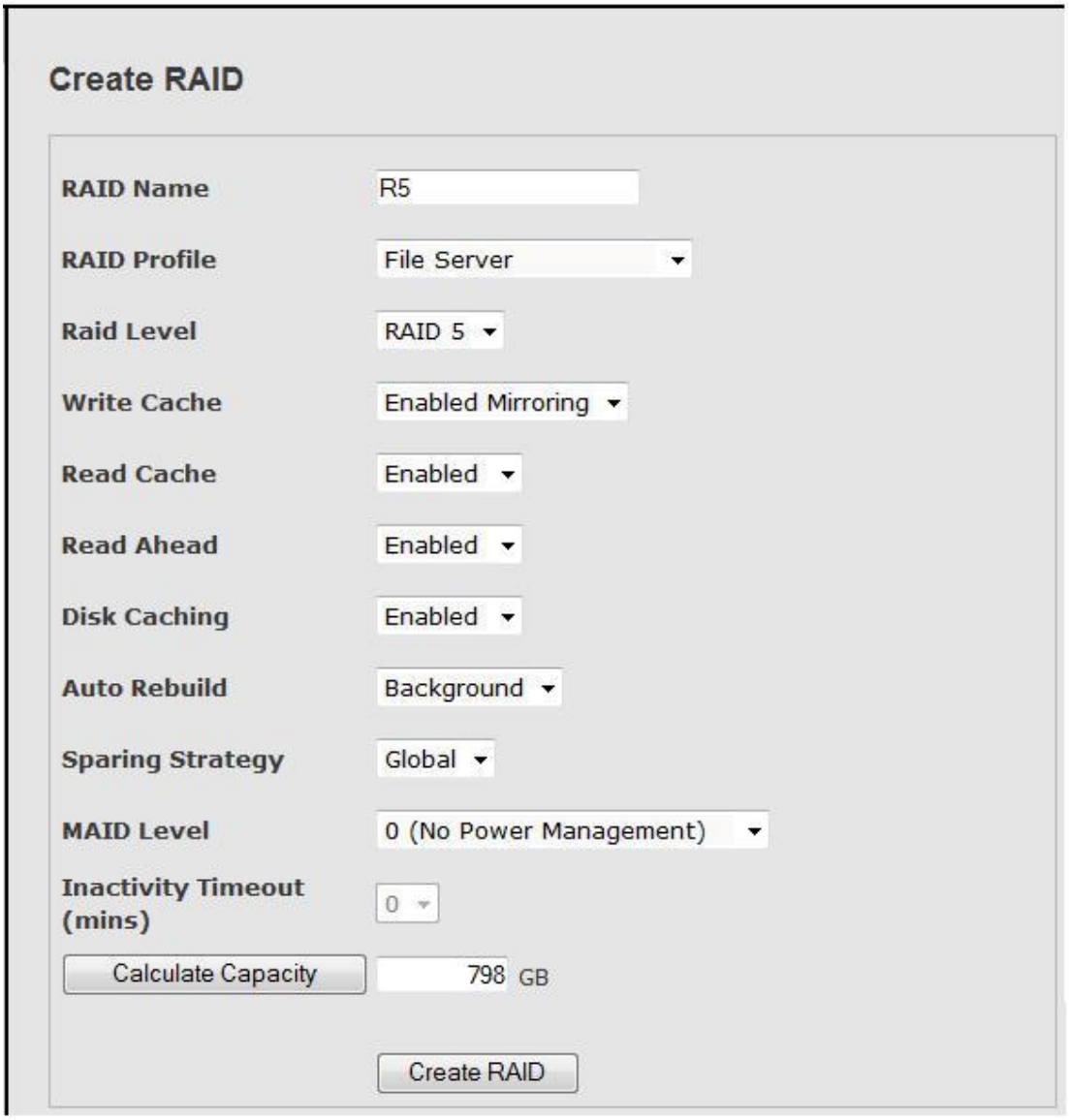


   b. Select the Inactivity Timeout (mins) after which the disks will go into the selected power mode as configured by the MAID Level (only configurable for MAID Level 1 and higher).

MAID Level:	Option (mins):
1 (Idle disk after timeout)	10, 20, 30, 45, 60
2 (Low Speed after timeout)	10, 20, 30, 45, 60
3 (Standby after timeout)	20, 30, 45, 60, 90, 120, 180

   Refer to Section 6.10 Intelligent Power Management for more information.

5. Select **Calculate Capacity** button to get the RAID Set total capacity.



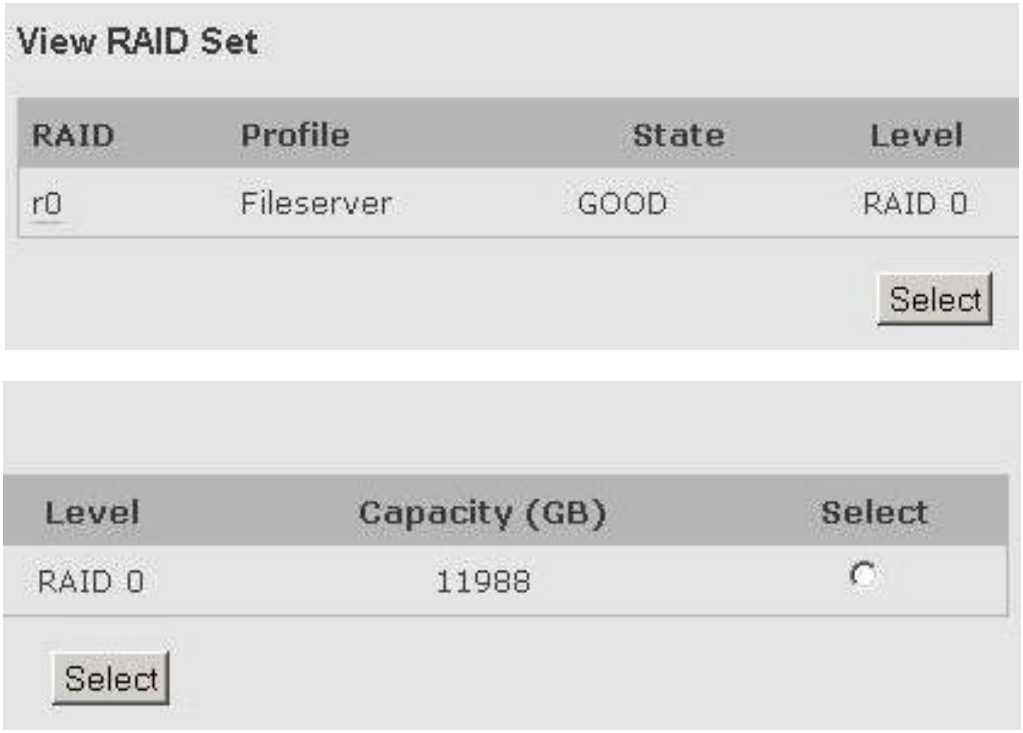
6. To create the RAID Set, click the **Create RAID** button.

7. The RAID will initialize. If you have free disk drive, you can select "Open spare selection screen" to allocate hot spare drive.

8. The NEXT step is to create Logical Volume(s). See Logical Volume Functions → Create Logical Volume.

6.3 View RAID Set

The **RAID Functions ➔ View RAID Set** screen displays a summary of all RAIDs currently created on the system.



The following table gives an explanation of each option/action available on this screen:

Field	Description
RAID	User-friendly name that helps you identify the RAID.
Profile	Defines the general operating or application environment in which the RAID will be used (e.g. one RAID volume might be optimized for database applications while another might be optimized for file server applications). Configured when the RAID is created.
State	The states available are: Good, Degraded, Rebuilding, Initializing, Expanding, Verifying, and Inaccessible. If the RAID is rebuilding, initializing, expanding or verifying, the progress of the task will be displayed in brackets, e.g. 'Initializing (75%)'.
Level	Configured when the RAID is created. The current options are levels 0, 1, 10, and 5. A RAID 10 will be displayed as a RAID 1.
Capacity (GB)	Capacity of the RAID in Gigabytes.
Select	Click to see more information about the selected RAID Set.

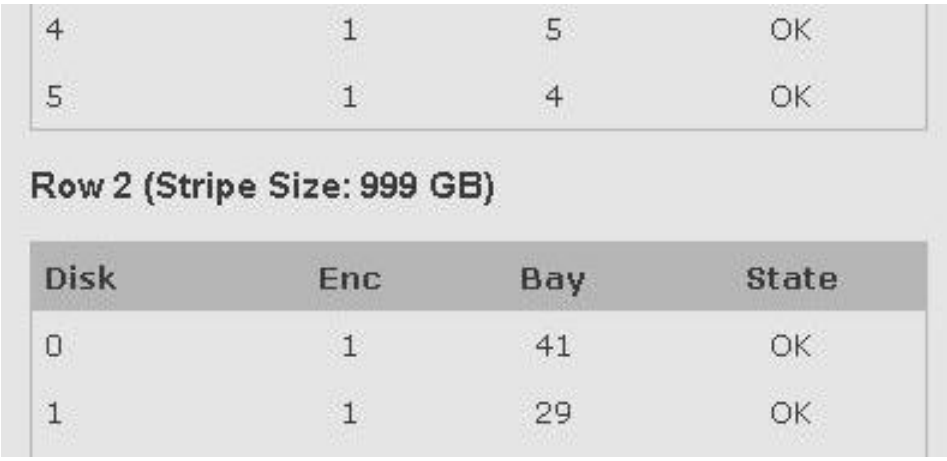
The RAID information screen of a selected RAID Set:

RAID Status

Name	r0
Serial Number	0303023f 13700011
Profile	Fileserver
State	GOOD
Level	RAID 0
Capacity (GB)	11988
Write Cache	Enabled Mirroring
Read Cache	Enabled
Read Ahead	Enabled
Disk Caching	Enabled
Auto Rebuild	Disabled
Sparing	None
MAID Level	0 (No Power Management)
Inactivity Timeout (mins)	0
Number of Rows	2
Number of Columns	6

Row 1 (Stripe Size: 999 GB)

Disk	Enc	Bay	State
0	1	9	OK
1	1	8	OK
2	1	7	OK
3	1	6	OK



4	1	5	OK
5	1	4	OK

Row 2 (Stripe Size: 999 GB)

Disk	Enc	Bay	State
0	1	41	OK
1	1	29	OK

The RAID information screen will also show the number of Rows and Columns in a RAID, and which Row the disk drives belong to.

6.4 Modify/Delete RAID Set

You can use the **RAID Functions ➔ Modify/Delete RAID Set** to re-configure a RAID. The modifications that can be carried out on the RAID are:

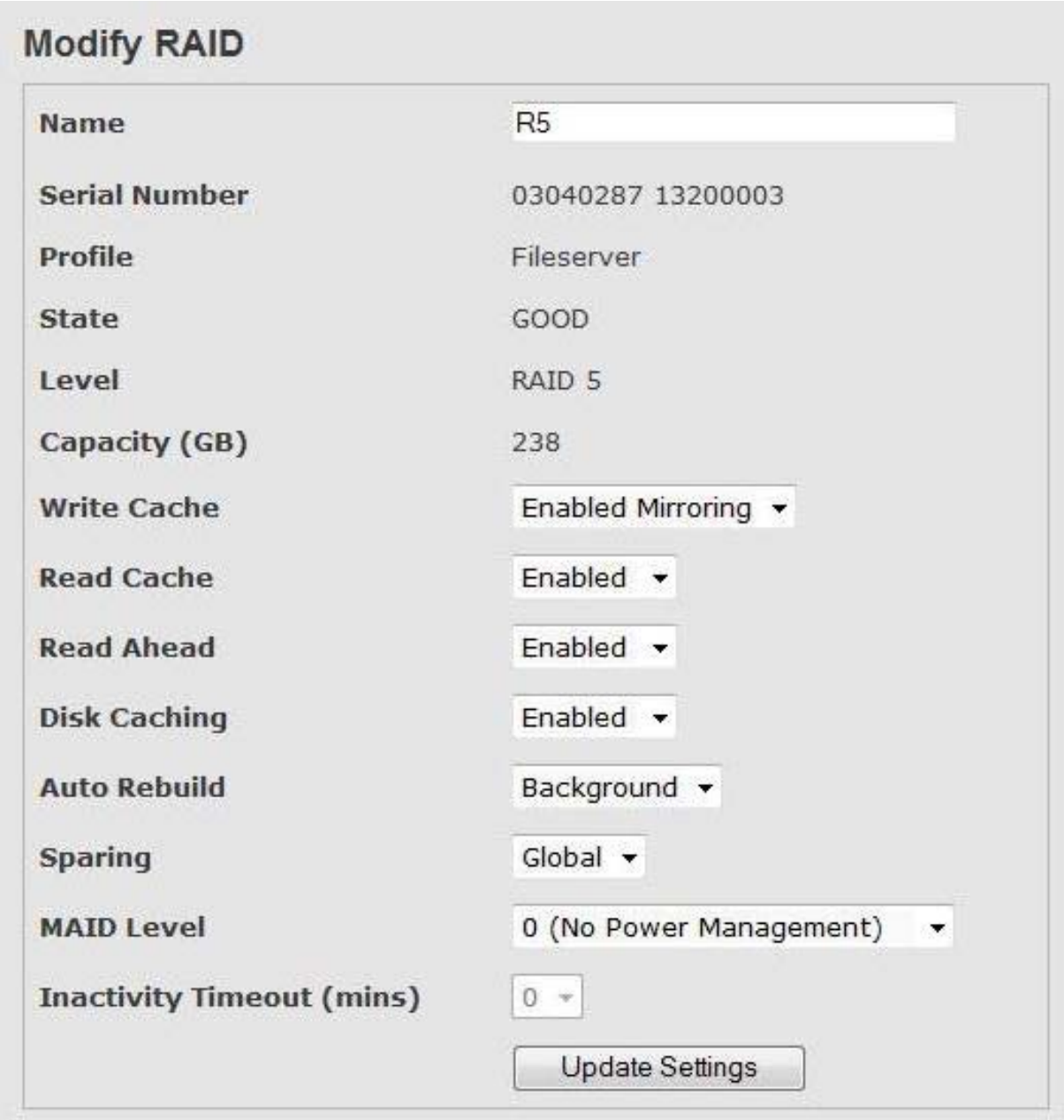
- Change Settings - cache size, auto rebuild settings, etc.
- Delete the RAID
- Rename the RAID
- Rebuild the RAID – if the RAID is degraded

6.4.1 Change Settings

You can change any of the settings for your RAID from the **RAID Functions ➔ Modify/Delete RAID Set** screen, as follows:

1. Select the RAID you wish to modify by clicking on the **Modify** button in the row corresponding to the RAID of interest.

2. Select the field that you wish to change, and (where available) choose an option from the drop-down menu.



3. Click on the **'Update Settings'** button to save the settings.

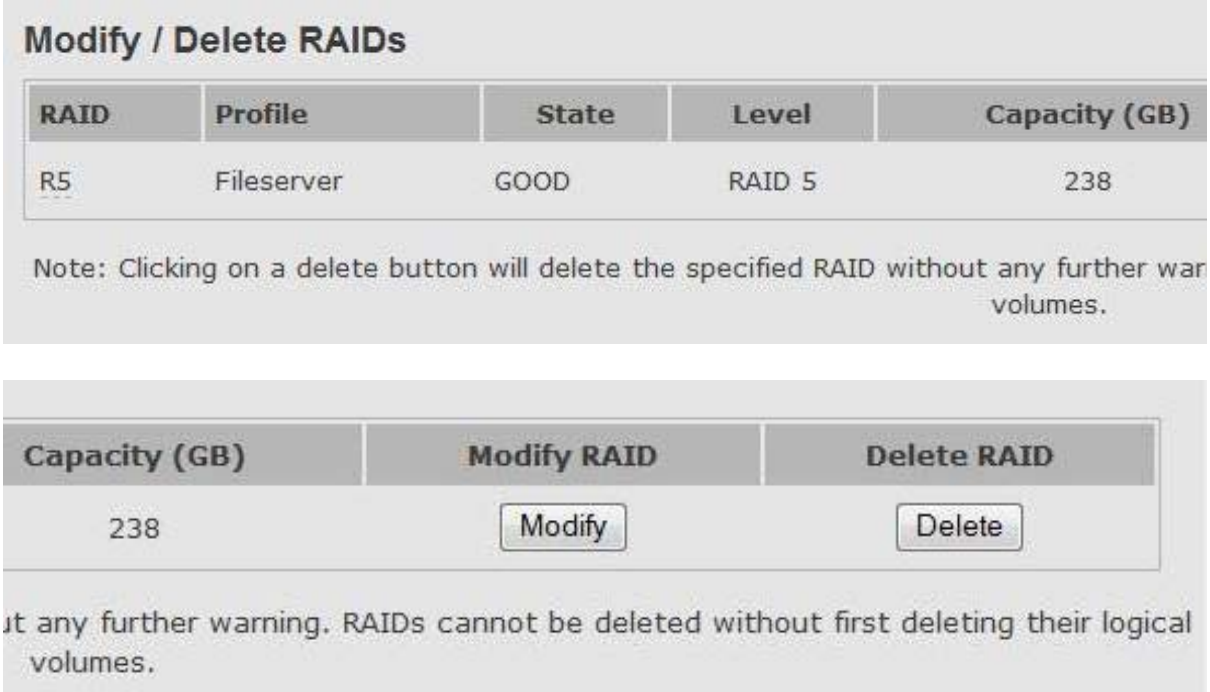
NOTE: All options display a confirmation box before continuing with the operation.

NOTE: The RAID name has a maximum of 31 characters.

6.4.2 Deleting the RAID

You can delete any RAID from the **RAID Functions → Modify / Delete RAID Set** screen, as follows:

1. Select the RAID you wish to delete by clicking on the **Delete** button in the row corresponding to the RAID of interest.



2. Confirm deletion of the RAID by selecting **'OK'** to confirm in the confirm dialog box which pops up prior to deletion.

3. If the RAID has logical volumes, it is not possible to delete the RAID without deleting the logical volumes first.

NOTE: When deleting a RAID, clicking on the Delete button will delete the specified RAID without any further warning. RAIDs cannot be deleted without first deleting their Logical Volumes.

6.4.3 Renaming the RAID

You can rename any of the RAIDs from the **RAID Functions ➔ Modify / Delete RAID Set** screen, as follows:

1. To modify the RAID, click on the **Modify** button in the row of the RAID of interest.

2. Enter the new name for the RAID in the 'Name' text box.

3. Select **'Update Settings'** to save the change and rename the RAID.

NOTE: The RAID name has a maximum of 31 characters.

6.5 Expanding a RAID

The **RAID Functions ➔ Expand RAID Set** screen allows you to expand an existing RAID by adding more disks to the RAID as required. Once the disks have been added and you initiate the expansion, the RAID will start to rebuild and incorporate the new capacity.

WARNING: Before expanding a RAID you should run RAID Verify on applicable RAID set(s) and confirm recognition of all new drives to be added.

If there is insufficient capacity on the RAID to expand an existing Logical Volume or to create a new Logical Volume, the RAID may be expanded to increase the available capacity.

NOTE: At least one spare disk is required to expand the RAID.

NOTE: When selecting disks for RAID expansion, never display Missing, Faulty or Broken disks, regardless of whether they are part of a RAID or spares.

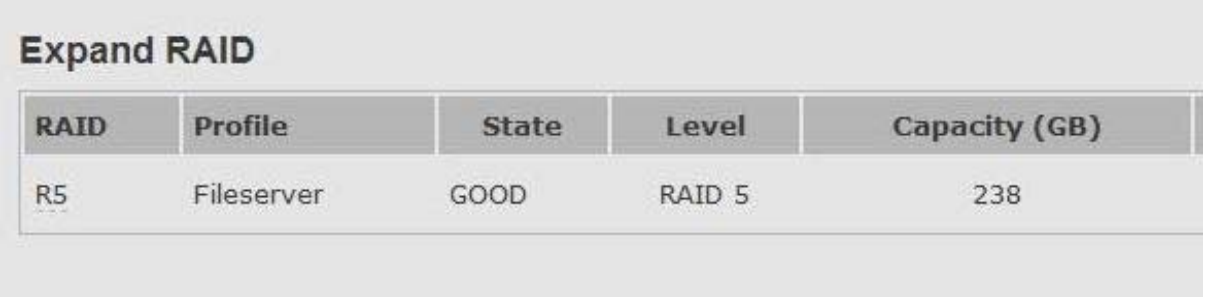
Use the following steps to expand a RAID:

1. Go to the **RAID Functions ➔ Expand RAID Set** menu option.
2. The following screen will present a list of disks available for expansion. Select any disks required for expansion by ticking the **Select** checkbox in the row of the disk of interest.

3. If all disks are required, click **Select All** button which will select all the available disks.

4. To continue click **Next** button.

5. On the following screen select the RAID to be expanded by clicking on the **Expand** button in the row of the RAID of interest.



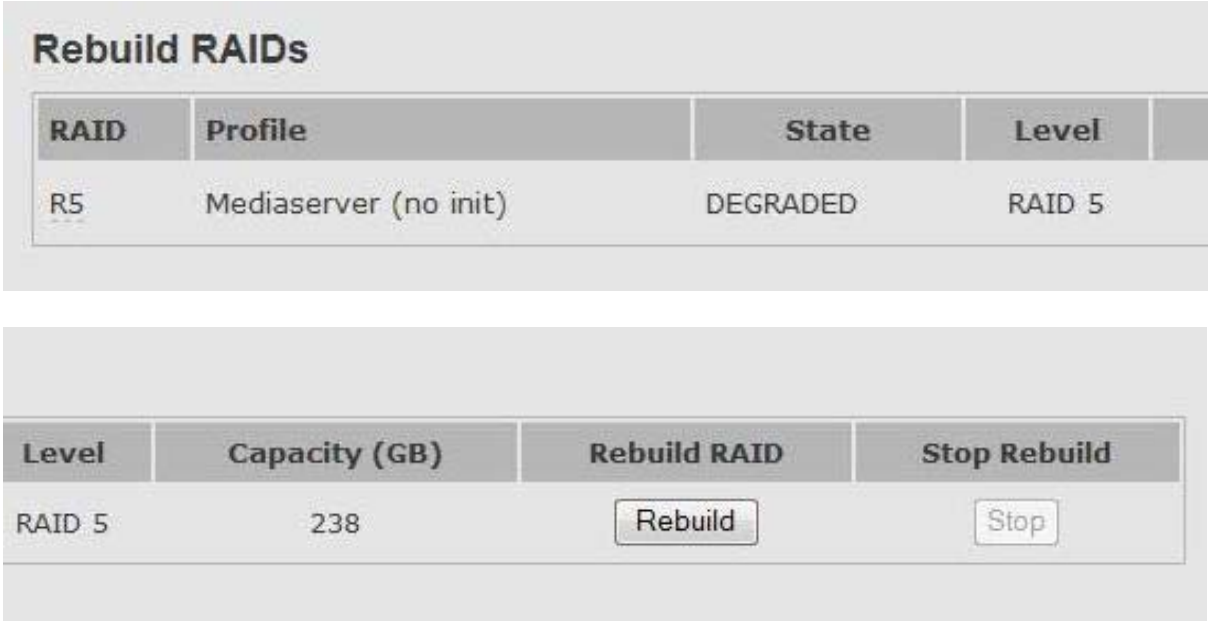
6. The RAID Set expansion process will start.

6.6 Rebuilding a RAID

You can rebuild a RAID from the **RAID Functions ➔ Rebuild RAID Set** screen, as follows:

NOTE: A RAID can only be rebuilt if it is in a degraded state. To verify a RAID refer to Section on Verifying a RAID.

1. Select the RAID you wish to rebuild by clicking on the **Rebuild** button in the row of the RAID of interest.



2. To stop the rebuild of a RAID, select the **Stop** button in the row of the rebuilding RAID.

6.7 Verifying a RAID

You can use the **RAID Functions ➔ Verify RAID Set** menu option to check the consistency of parity blocks, i.e. verify that parity information matches the stored data on the redundant arrays. This is only possible on RAID level 5 or 6; it is not possible to verify RAIDs created using RAID 0 or RAID 1. During a RAID Verify the system reads each stripe and checks for valid parity. At the end of the verify process the system sends an Alert if any stripes were found with invalid parity.

In the **Verify RAID Set** screen, select the **Verify** button corresponding to the RAID to be verified.

It is recommended that you schedule 'RAID Verify' to run periodically to ensure data availability.

6.8 Sparing Strategy

It is recommended that you reserve a spare disk in the configuration of the system for use as a replacement when a hardware error occurs on another disk in the system. The Sparing Strategy screen is used to set (or modify) the strategy used and to assign (or unassign) a disk as a spare.

The sparing strategies available are:

- **Global** - A disk that can be used by any RAID on the system that has global sparing strategy selected.
- **Local** - A disk that can only be used by the RAID in which it was added to.

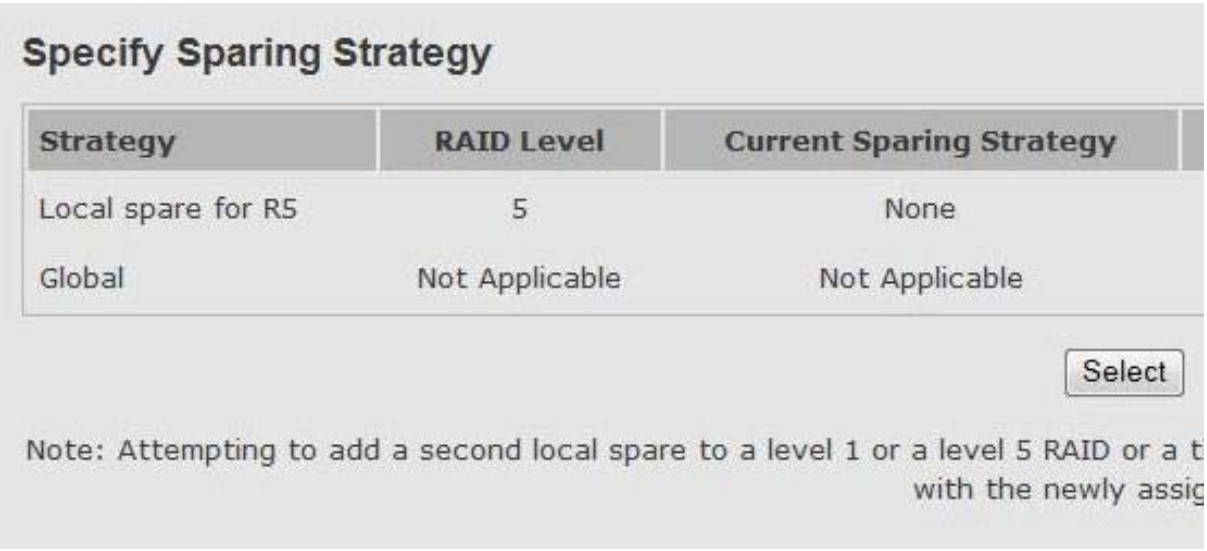
NOTE: A RAID that has a local spare cannot use the global spare.

- **None** - The RAID selected cannot use the global spare and does not have a local spare assigned. The RAID cannot be re-built automatically.

6.8.1 Creating a Hot Spare

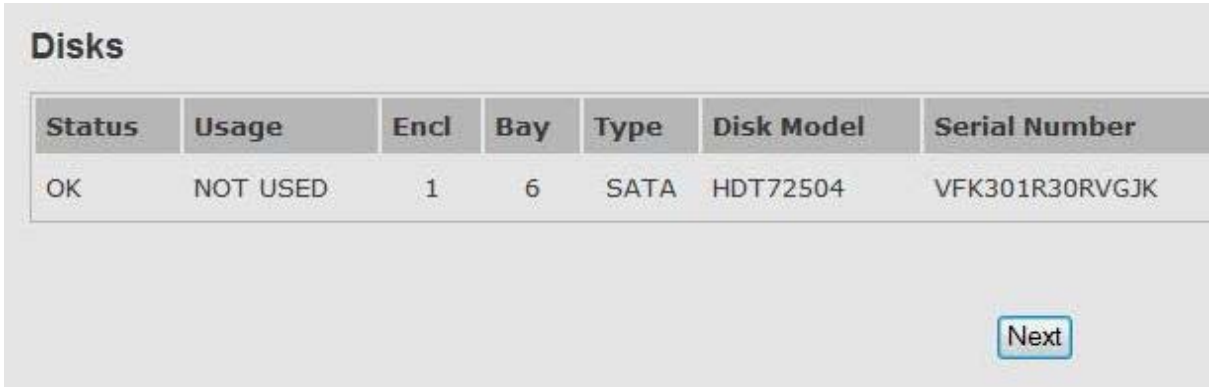
Select/change a sparing strategy from the **RAID Functions ➔ Create Hot Spare** screen as follows:

1. If a global spare is required, select the row where the Global option is listed. If a local spare is required for a particular RAID, select the according row by ticking the radio button for that row.



NOTE: Attempting to add a second local spare to a level 1 or a level 5 RAID or a third local spare to a level 6 RAID will replace one of the existing spares with the newly assigned disk.

2. Click **Select** to navigate to the Disk selection screen.
3. On the disk selection screen select the disk intended for the sparing strategy by ticking the radio button in the according row of that disk.



NOTE: When selecting disks for spares, never display Missing, Faulty or Broken disks, regardless of whether they are part of a RAID or spares.

4. Click **Next** to apply the selected disk as a spare as configured in the sparing strategy screen.

NOTE: Once assigned, the disk cannot be used for assigning as another spare or creating/expanding a RAID.

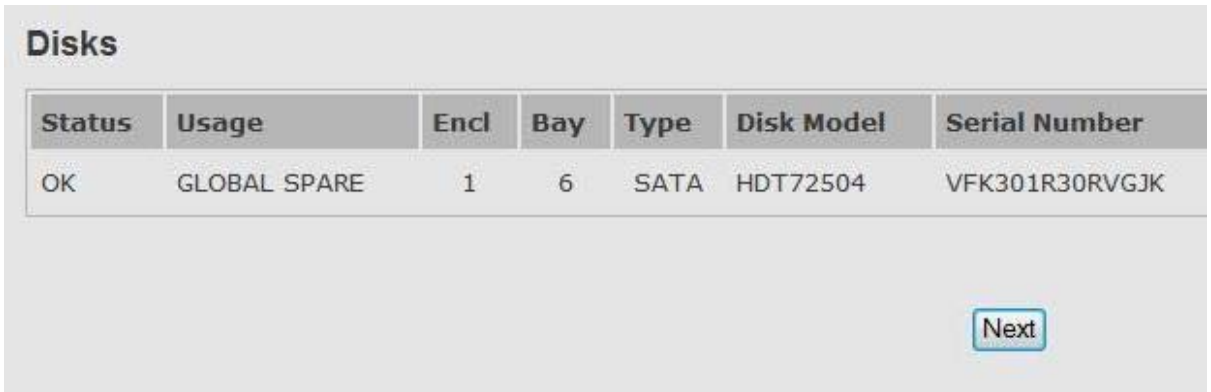
6.8.2 Deleting a Hot Spare

To delete a disk from the sparing strategy, navigate to the **RAID Functions ➔ Delete Hot Spare** screen.

This screen will list all spares in the system (global and local) and display relevant disk information of the spare disk.

To delete a disk from the sparing strategy, click the radio button in the row of the disk of interest and click on the **Next** button.

This will delete the disk as a spare.



Model	Serial Number	Firmware	Capacity (GB)	Errors	Select
72504	VFK301R30RVGJK	A7EA	400	0	◉

Next

6.8.3 Viewing Hot Spares

To view the sparing strategy in the current system, navigate to the **RAID Functions ➔ View Sot Spares** screen.

This screen will list all spares in the system (global and local) and display relevant disk information of the spare disk.

Hot Spares

Status	Usage	Encl	Bay	Type	Disk Model	Serial
OK	GLOBAL SPARE	1	6	SATA	HDT72504	VFK30

	Serial Number	Firmware	Capacity (GB)	Errors
	VFK301R30RVGJK	A7EA	400	0

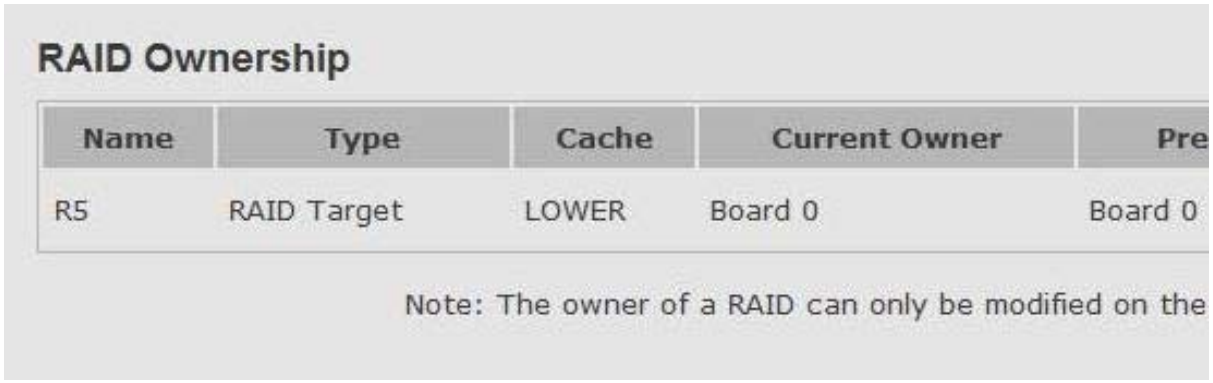
6.9 RAID Ownership

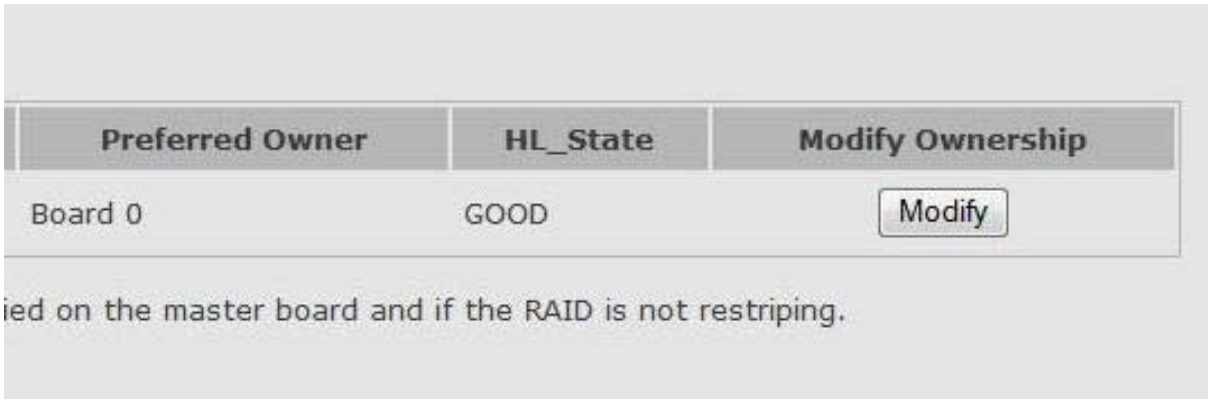
NOTE: Users are not allowed to change RAID ownership while RAID is initializing, verifying, rebuilding.

The **RAID Functions ➔ RAID Ownership** screen allows the user to view current RAID owners and also to modify the owners of a RAID.

Steps to modify RAID ownership:

1. To modify the users of a RAID, select the **Modify** button in the row of the RAID of interest.





2. In the following screen enter the board ID of the board that is to be the new owner of the RAID.

NOTE: "Board ID 0" = Controller 1, and "Board ID 1" = Controller 2.

3. Click the **Save** button to save the changes.

6.10 Intelligent Power Management

MAID (Massive Array of Idle Disks) enabled storage allows disks which have been inactive for a defined period of time to be placed into one of several power-saving modes. The Logical Volumes associated with these disks remain on-line and available to read and write data. If these disks subsequently receive a read or write request, the storage controller will return the disks to active mode and then issue the data commands. The host will experience a delay in accessing the volume which can vary from under 1 second to 30 or 40 seconds depending on which power saving mode the disk is resuming from.

For example, the storage system can implement MAID Level-0 (no real energy savings, no impact to performance) for active data. For less active data, an administrator can choose a user selectable setting to transition the storage system to MAID Level-1 where power is reduced by retracting HDD read/write heads. For even better power savings, a HDD or RAID can be put into a MAID Level-2 mode where the speed of the drive platters is reduced. For the best power savings, the administrator can select MAID Level-3 where a HDD or the RAID is completely powered down or put into a suspended standby sleep mode.

6.10.1 Power Modes (MAID Levels)

Level 0: No Power Management
The device is capable of responding immediately to media access requests, and commands complete execution in the shortest possible time.

Level 1: Idle Mode
The disk is capable of responding immediately to media access requests. A device in Idle Mode may take longer to complete the execution of a command because it may have to activate some circuitry. Different manufacturers have interpreted this in different ways.

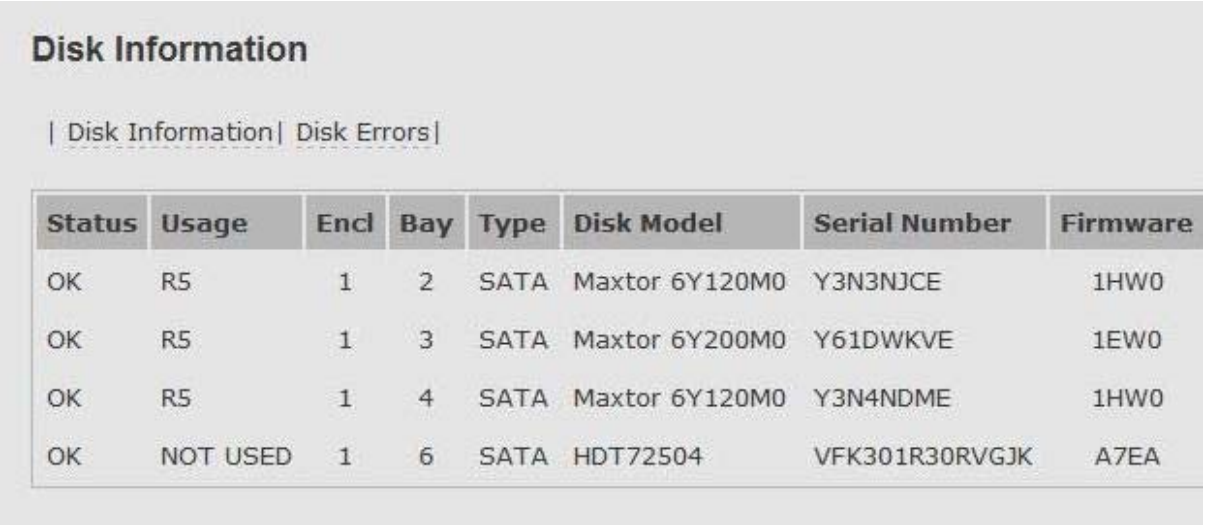
Level 2: Low Speed Mode
The Low Speed state still keeps the heads parked but the spindle motor is also slowed to a lower spin rate (approximately 60% of normal). The disk goes into this mode after a specified time interval. The drive can be restored to active mode by any media access request.
Only disk drives with Advanced Power Management (APM) can support Low Speed Mode. Disks without APM will remain in Idle Mode instead of transitioning to Low Speed Mode. They will transition directly to Standby Mode at the end of the Standby timeout time.

Level 3: Standby Mode
The disk interface is capable of accepting commands, but as the media may not be immediately accessible, it could take the disk as long as 30 seconds to respond.

6.10.2 Advanced Power Management (APM)

Certain disks are capable of APM which allows those disks to transition into a Low Speed Mode (see Power Modes above), if required.

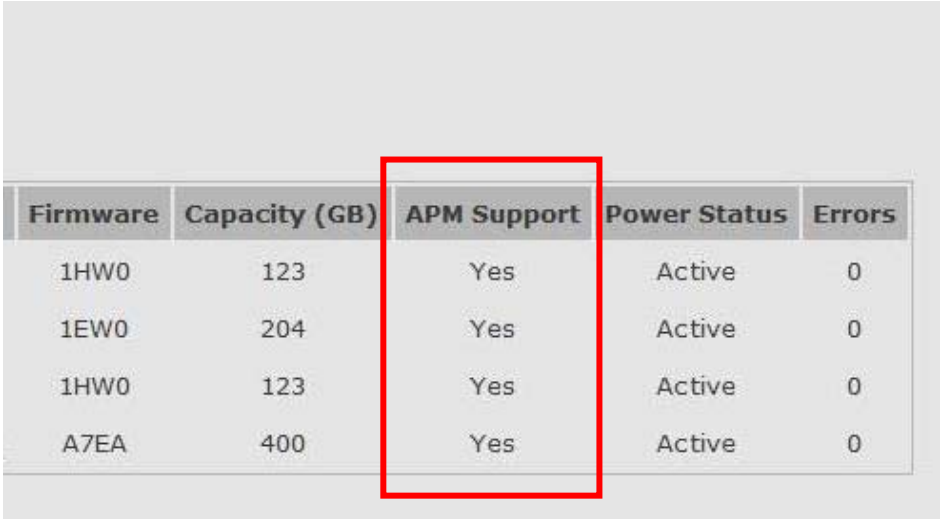
To find out, whether a disk in the system supports APM simply navigate to the **Monitoring ➔ Disks** screen and select the 'Disk Information' tab. The 'Disk Information' table will display a column, that indicates whether APM is supported by a disk or not.



Disk Information

| Disk Information | Disk Errors |

Status	Usage	Encl	Bay	Type	Disk Model	Serial Number	Firmware
OK	R5	1	2	SATA	Maxtor 6Y120M0	Y3N3NJCE	1HW0
OK	R5	1	3	SATA	Maxtor 6Y200M0	Y61DWKVE	1EW0
OK	R5	1	4	SATA	Maxtor 6Y120M0	Y3N4NDME	1HW0
OK	NOT USED	1	6	SATA	HDT72504	VFK301R30RVGJK	A7EA



Firmware	Capacity (GB)	APM Support	Power Status	Errors
1HW0	123	Yes	Active	0
1EW0	204	Yes	Active	0
1HW0	123	Yes	Active	0
A7EA	400	Yes	Active	0

Chapter 7 Logical Volume Management

Logical Volumes are required for assigning mappings to Hosts. A Logical Volume can be expanded or re-assigned to a different Host after it has been created.

A Logical Volume can be created either as a private volume or as a global volume.

Global Logical Volumes:
Global logical volumes can be mapped to user-specified ports. Once a global volume is mapped to a port, all hosts that log into that port can access the logical volume at the configured LUN for this port. Hosts that are not logged into a mapped port will not be able to access the global volume.

Private Logical Volumes:
Private logical volumes can be mapped to user-specified ports AND hosts. Private volumes can have a set of ports enabled, at which they can be accessible by selected hosts only. Private volumes are only accessible by hosts that have been mapped to that volume at a specified LUN. In addition, the host also needs to be logged into a port that has been enabled for the private volume.
Hosts that are not mapped to a private volume will not be able to access the private volume irrelevant of the login port.
Mapping hosts to volumes can be performed on the **Logical Volume Functions ➔ Host Mapping** screen.

WARNING! Any file system on a mapped Logical Volume may be lost if it is re-mapped to a different host.

The following functions are available with respect to Logical Volumes:

- View - see the status of a Logical Volume
- Create - create a new Logical Volume
- Modify, Delete - modify, expand or delete Logical Volumes
- Host Mapping - assign hosts to logical volumes

7.1 Viewing Logical Volume Details

The Logical Volume Functions (View Logical Volumes menu option allows the user to view a list of the current Logical Volumes created on the system.

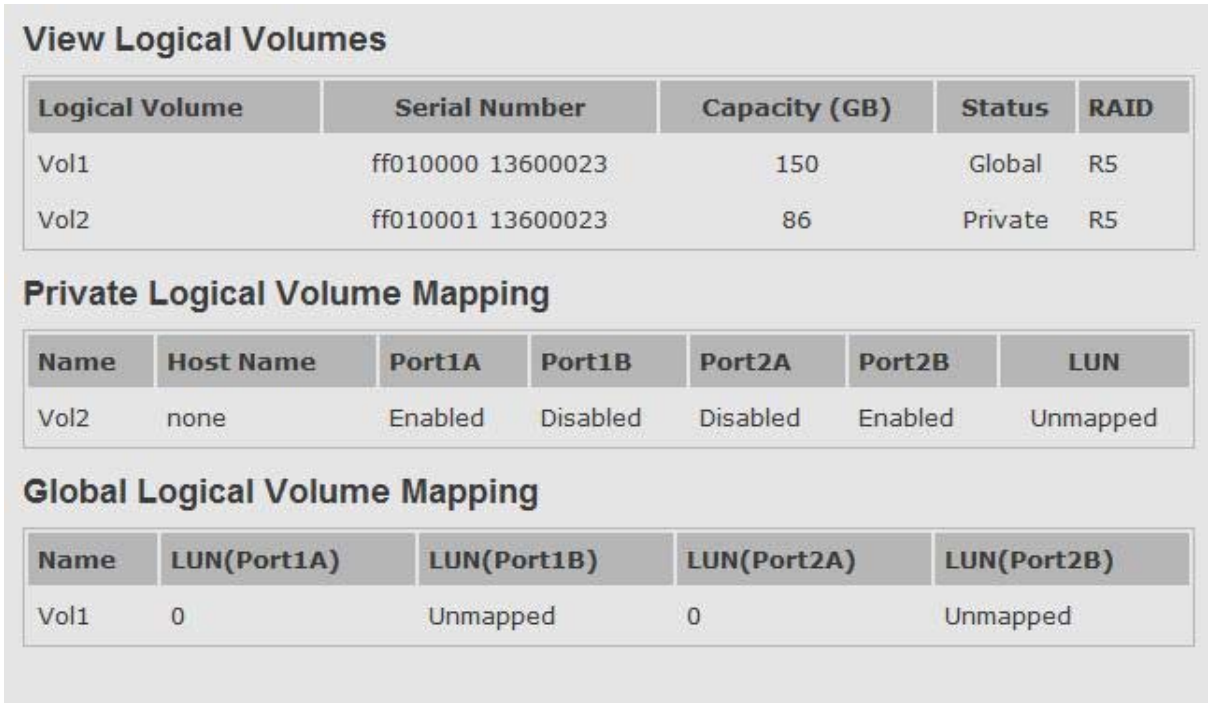
The view is broken down into three tables:

1. View of all logical volumes in the system
2. View of all private logical volumes in the system along with their LUN mapping status
3. View of all global logical volumes in the system along with their LUN mapping status

The first table provides generic information (such as Name, Serial Number, Capacity, Status and parent RAID) about each logical volume.

The second table provides specific mapping information on each private logical volume. The table displays logical volume name, host names of any hosts mapped to a particular volume, port mask for each private volume and the LUN to which the private logical volume has been mapped to for a certain host.

The third table provides specific mapping information on each global logical volume. The table displays logical volume name and for each port the LUN, that the logical volume has been globally mapped to. If "Unmapped" is displayed, then the port has not been mapped to any LUN which means that no host will be able to access this volume through the "Unmapped" port.



View Logical Volumes

Logical Volume	Serial Number	Capacity (GB)	Status	RAID
Vol1	ff010000 13600023	150	Global	R5
Vol2	ff010001 13600023	86	Private	R5

Private Logical Volume Mapping

Name	Host Name	Port1A	Port1B	Port2A	Port2B	LUN
Vol2	none	Enabled	Disabled	Disabled	Enabled	Unmapped

Global Logical Volume Mapping

Name	LUN(Port1A)	LUN(Port1B)	LUN(Port2A)	LUN(Port2B)
Vol1	0	Unmapped	0	Unmapped

The following table gives an explanation of each field available on this screen:

View Logical Volumes

Field	Description
Logical Volume	Name of the Logical Volume.
Serial Number	Internal Serial Number of the Logical Volume.
Capacity (GB)	Capacity of the Logical Volume in Gigabytes
Status	Indicates whether the volume is a global or private logical volume.
RAID	The name of the RAID on which the Logical Volume was created.

Private Logical Volume Mapping

Field	Description
Name	Name of the Logical Volume.
Host Name	Displays any hosts, that have been mapped to a private LV.
Port 1A	Indicates whether the port is enabled of disabled for the private volume.
Port 1B	Indicates whether the port is enabled of disabled for the private volume.
Port 2A	Indicates whether the port is enabled of disabled for the private volume.
Port 2B	Indicates whether the port is enabled of disabled for the private volume.
LUN	LUN to which the volume has been mapped for a specific host.

Global Logical Volume Mapping

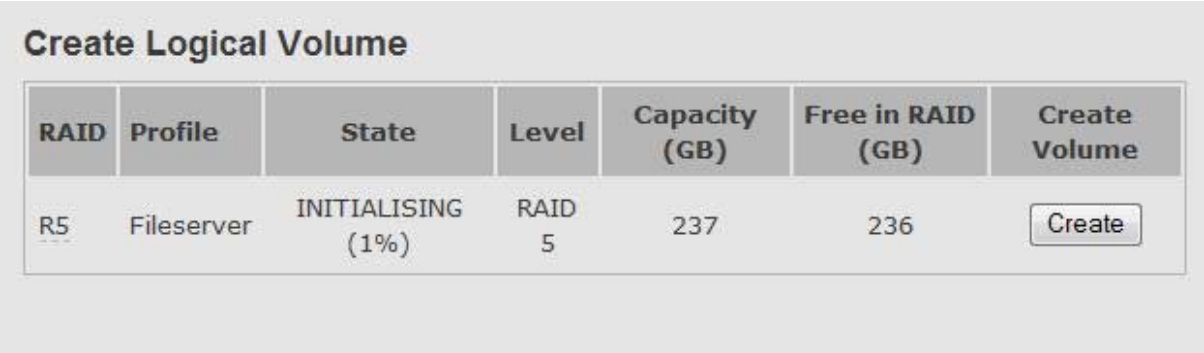
Field	Description
Name	Name of the Logical Volume.
LUN (Port 1A)	LUN to which the global volume has been mapped to at port 1A
LUN (Port 1B)	LUN to which the global volume has been mapped to at port 1B
LUN (Port 2A)	LUN to which the global volume has been mapped to at port 2A
LUN (Port 2B)	LUN to which the global volume has been mapped to at port 2B

7.2 Creating a Logical Volume

To create a new logical volume, navigate to the **Logical Volume Functions ➔ Create Logical Volume** screen.

Complete the following steps to create a Logical Volume:

1. In the 'Logical Volume Functions -> Create Logical Volume' screen, select the RAID on which the new Logical Volume is to be created, by using the **Create** button in the row of the selected RAID.



2. The following screen will allow the user to make the following adjustments:

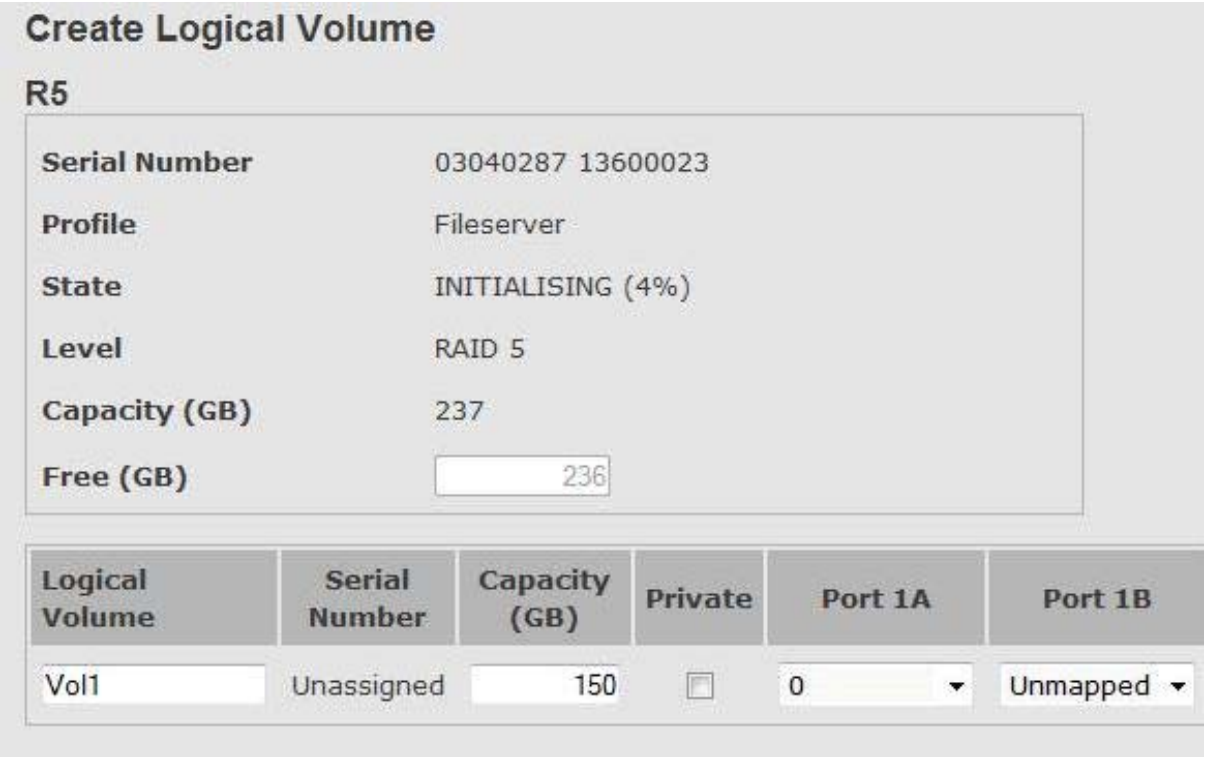
   a. Assign and enter a **name** for the Logical Volume in the 'Logical Volume' text box.

   b. If the logical volume is to be a private volume, tick the checkbox labeled "Private". If the logical volume is to be a global volume, leave the checkbox un-ticked.

   c. If the volume is a private volume, enable or disable the ports of interest by selecting the appropriate value from the drop-down box for each port.

   d. If the volume is a global volume, either map the volume to a port by selecting a LUN from the drop-down box for that port or leave the volume unmapped at a certain port, by selecting "Unmapped" for that port.

   e. Enter the required **capacity** (in Gigabytes) of the Logical Volume to be created.



NOTE: Once a Logical Volume has been created, its global/private status and port mappings can be modified at any stage on the Logical Volume Functions ➔ Modify/Delete Volume screen. In order to map a host to a private logical volume, the user will need to navigate to the Logical Volume Functions ➔ Host Mapping screen.

NOTE: The maximum capacity of all Logical Volumes on a RAID is limited to the capacity of the RAID itself. If there is not enough capacity to expand the Logical Volume, the RAID must be expanded first.

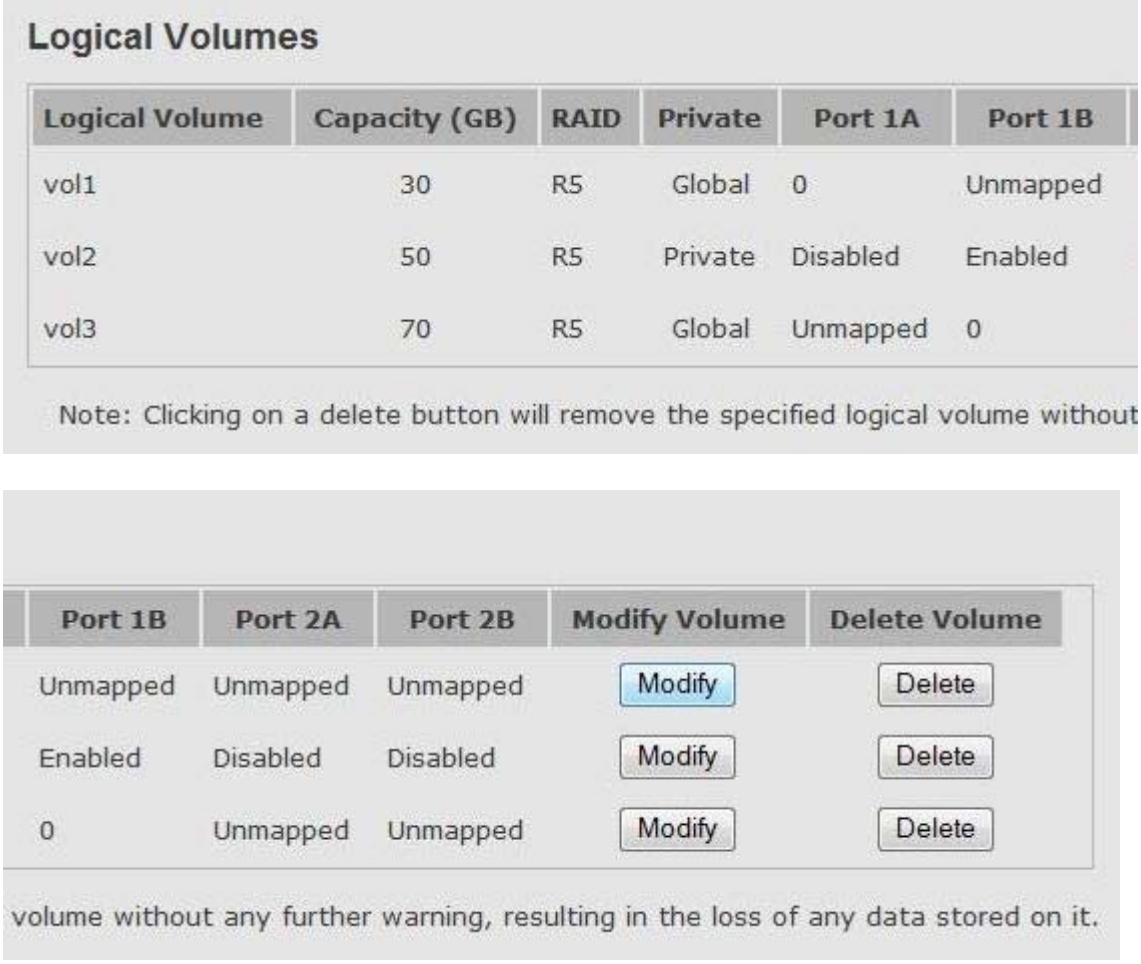
3. Click on **'Add'** to create the Logical Volume.
4. If the Logical Volume is a Private Volume, the NEXT step is to map the Logical Volume to Host. See Logical Volume Functions → Host Mapping.

7.3 Modifying, Expanding, or Deleting a Logical Volume

The **Logical Volume Functions ➔ Modify / Delete Volume** screen allows you to modify, expand or delete a Logical Volume.

Steps to modify or expand a volume:

1. On the 'Logical Volume Functions -> Modify/Delete Volume' screen, select the 'Modify' button for the logical volume of interest.



Logical Volumes

Logical Volume	Capacity (GB)	RAID	Private	Port 1A	Port 1B	Port 1B	Port 2A	Port 2B	Modify Volume	Delete Volume
vol1	30	R5	Global	0	Unmapped	Unmapped	Unmapped	Unmapped	Modify	Delete
vol2	50	R5	Private	Disabled	Enabled	Enabled	Disabled	Disabled	Modify	Delete
vol3	70	R5	Global	Unmapped	0	0	Unmapped	Unmapped	Modify	Delete

Note: Clicking on a delete button will remove the specified logical volume without any further warning, resulting in the loss of any data stored on it.

2. The following page will present you with a screen that allows you to modify or expand a logical volume.

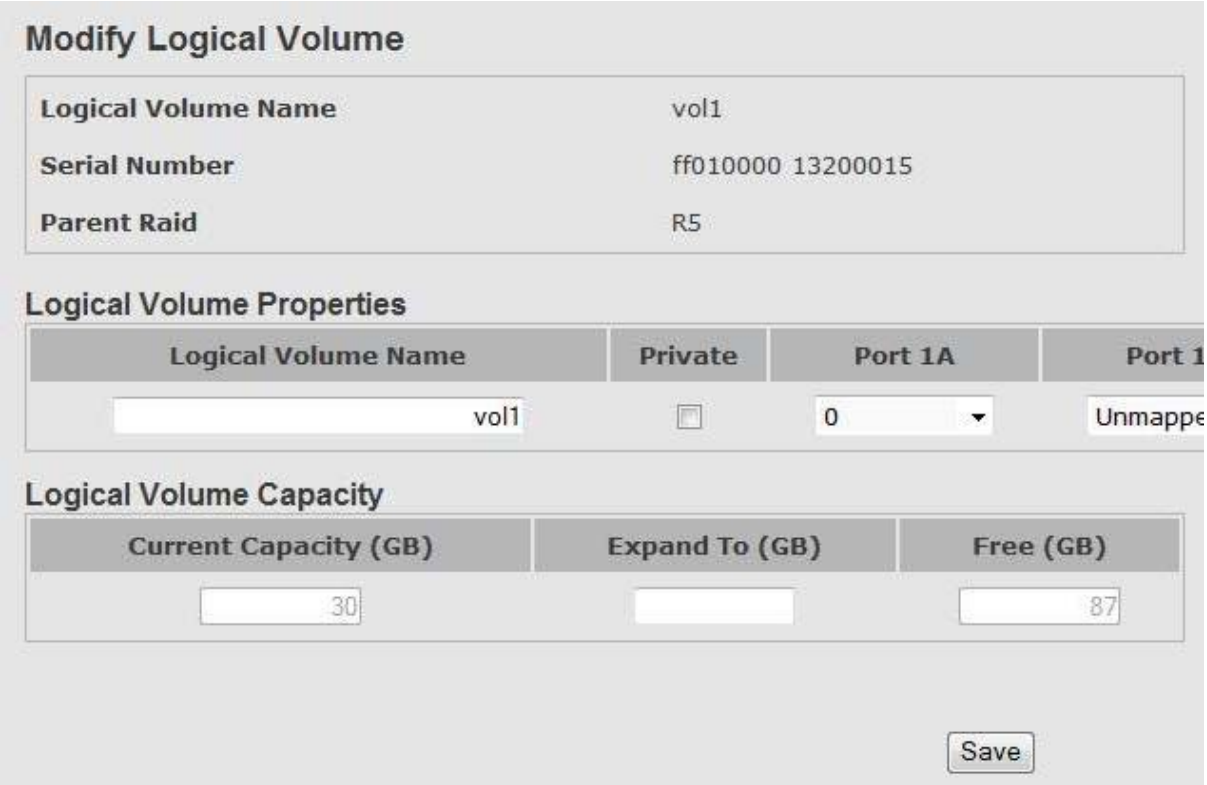
   a. To change the name of the Logical Volume, replace the current name with the new name in the 'Logical Volume Name' field.

   b. To change the status of a volume from global to private or vice-versa tick or un-tick the checkbox labeled "Private". To make the logical volume a private one, tick the box. To make it global, leave the box un-ticked.

c. To change the port map of a Private Logical Volume, select either "Enabled" to enable a port or "Disabled" to disable a port for this private volume. Private volumes cannot be mapped to specific hosts on this screen. This will have to be done on the Host Mapping screen.

d. To change the port map of a Global Logical Volume, ensure the drop-down box of the port of interest has been set to a value other than "Unmapped". A value of "Unmapped" disables or hides the global logical volume on the specified ports with the effect that no hosts will be able to access the volume, irrelevant of login port. To make a global volume visible on a specific port, select a suitable LUN from the drop-down list. Specifying a LUN for a port means, that the global logical volume will be visible on the selected port at the specified LUN. This applies to all hosts logging into that port.

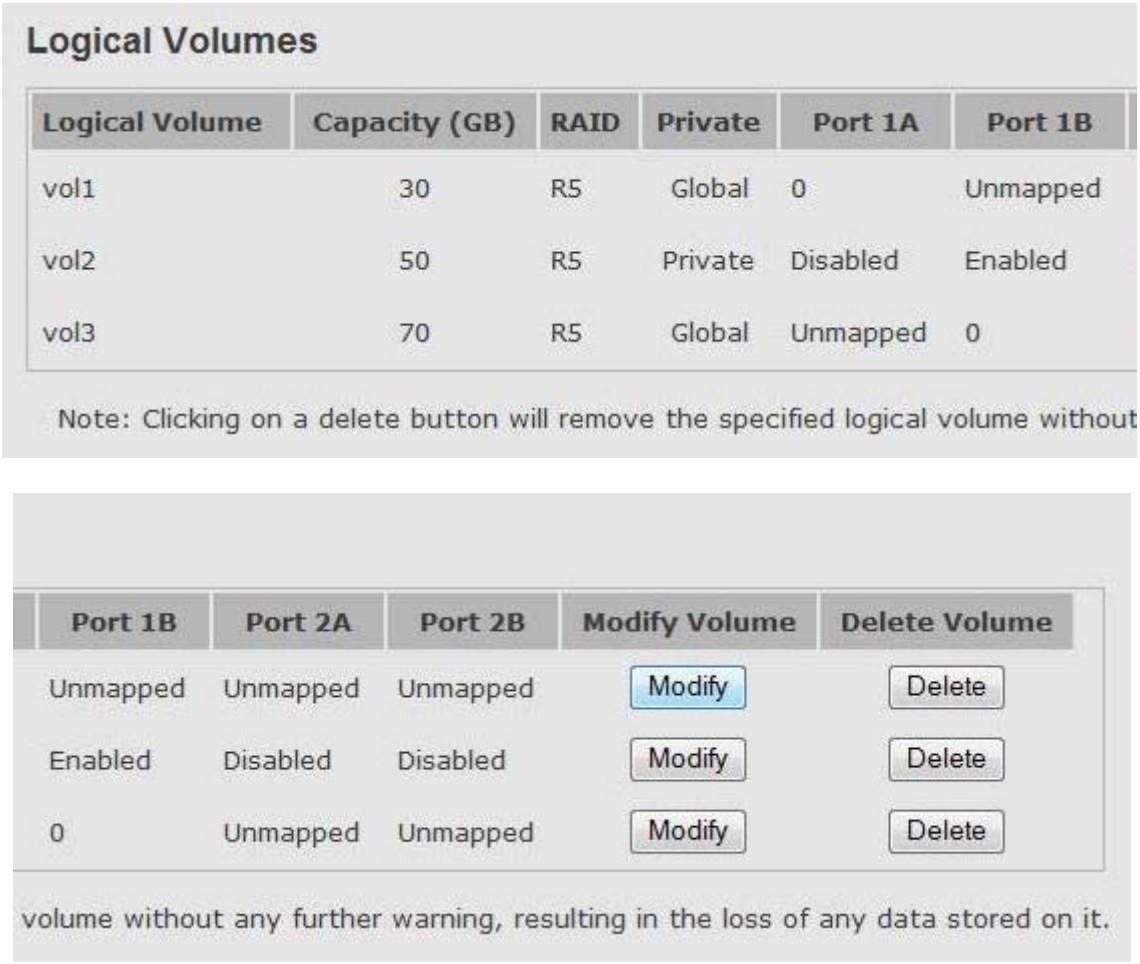
e. To modify the Capacity of the Logical Volume, enter the desired capacity in the 'Expand To (GB)' field.



3. Click on **'Save'** to save your changes.

To delete a volume:

On the **Logical Volume Functions ➔ Modify / Delete Volume** screen, select the 'Delete' button for the logical volume of interest. This will prompt the user to confirm the deletion of the logical volume. If a logical volume (global or private) has any active LUN mapping, the user will also be prompted to confirm the deletion of the logical volume.



Logical Volumes

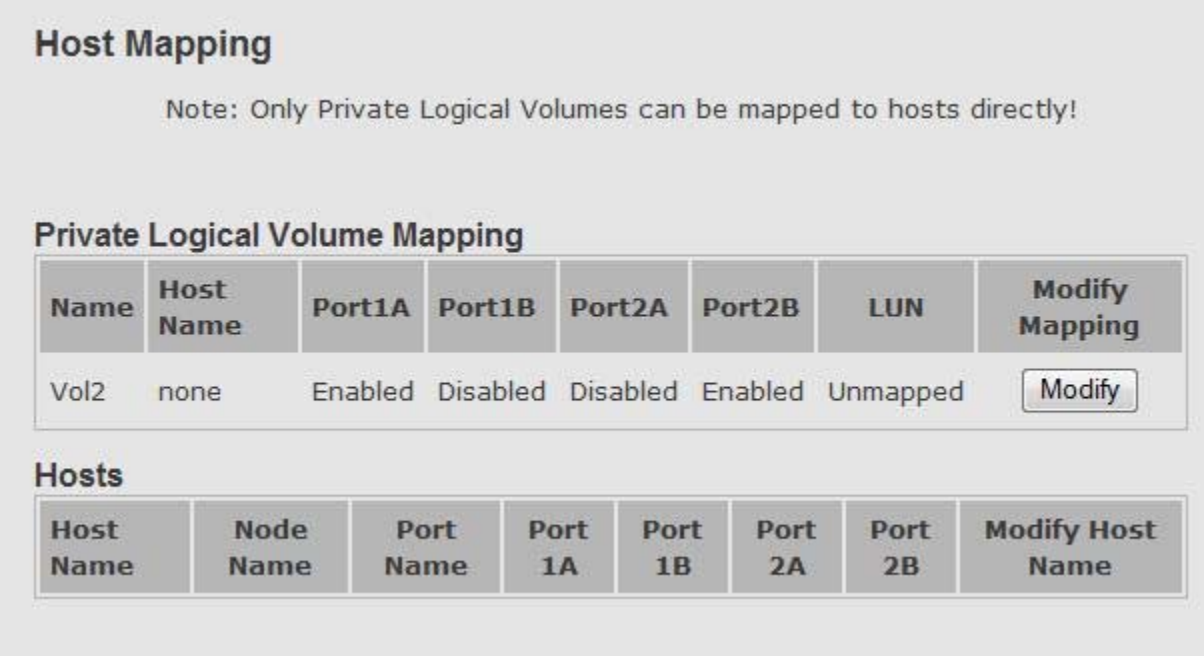
Logical Volume	Capacity (GB)	RAID	Private	Port 1A	Port 1B	Port 2A	Port 2B	Modify Volume	Delete Volume
vol1	30	R5	Global	0	Unmapped	Unmapped	Unmapped	Modify	Delete
vol2	50	R5	Private	Disabled	Enabled	Disabled	Disabled	Modify	Delete
vol3	70	R5	Global	Unmapped	0	Unmapped	Unmapped	Modify	Delete

Note: Clicking on a delete button will remove the specified logical volume without any further warning, resulting in the loss of any data stored on it.

WARNING: If a Logical Volume is deleted, all data in that Logical Volume will be lost.

7.4 Host Mapping

The **Logical Volume Functions ➔ Host Mapping** screen allows you to map private logical volumes to hosts.



Private Logical Volumes

Host mapping can only be carried out for private logical volumes.

If a logical volume is a private logical volume, the user can configure which hosts shall have access to a private logical volume by mapping the host to a LUN.

If the LUN for a host is "Unmapped", the host is not mapped to the private logical volume.

A host can only access a private logical volume when:
1. The host has been mapped to a LUN for that private logical volume
2. The host is logged into a port that is marked as "Enabled" for the private logical volume.

Finally, a private logical volume can be converted to a global logical volume. Converting a private volume to a global volume will remove the private mappings for this logical volume, i.e. it will be unmapped from all the hosts it has been mapped to. The 'Modify/Delete Volume' screen allows a user to convert a volume from private to global or vice-versa.

Global Logical Volumes

Specific host mapping cannot be carried out for global logical volumes.

A global logical volume can be converted to a private logical volume.

This will remove the global volume from the ports, that it has been mapped to and with that from all the hosts that are logged into those ports. The 'Modify/Delete Volume' screen allows a user to convert a volume from private to global or vice-versa.

NOTE: Global Volume Mapping overrides Private Volume Mapping!

Assume the following scenario:
Private volume LV1 mapped to host 1 at LUN 0 with port 1A enabled.
Global volume LV2 mapped to LUN 0 for port 1A.
Host 1 logged into port 1A.
In this scenario host 1 will not see private volume LV1 at LUN0 as the global volume mapping has precedence.

The following table gives an explanation of the Private Logical Volumes Mapping table:

Field	Description
Name	Displays the name of a private logical volume
Host Name	Displays the name of a host mapped to the corresponding logical volume. If "none" is displayed, no host has been mapped to the volume
Port1A	Displays the mapping status of the logical volume's port 1A, i.e. enabled or disabled
Port1B	Displays the mapping status of the logical volume's port 1B, i.e. enabled or disabled
Port2A	Displays the mapping status of the logical volume's port 2A, i.e. enabled or disabled
Port2B	Displays the mapping status of the logical volume's port 2B, i.e. enabled or disabled
LUN	Displays the LUN that the logical volume has been mapped to for a specific host
Modify Mapping	Select this, if you wish to modify the Host Mapping for a specific private logical volume

The following table gives an explanation of the Hosts table:

Field	Description
Host Name	Displays the name of a all hosts logged into the system. It also displays any hosts, that are no longer logged in, but are still mapped to a private logical volume
Node Name	Displays the host's node name
Port Name	Displays the host's port name
Port1A	Displays the login status of the host at port 1A
Port1B	Displays the login status of the host at port 1B
Port2A	Displays the login status of the host at port 2A
Port2B	Displays the login status of the host at port 2B
Modify Host Name	Select this, if you wish to modify the Host Name of a host

Chapter 8 System Monitoring

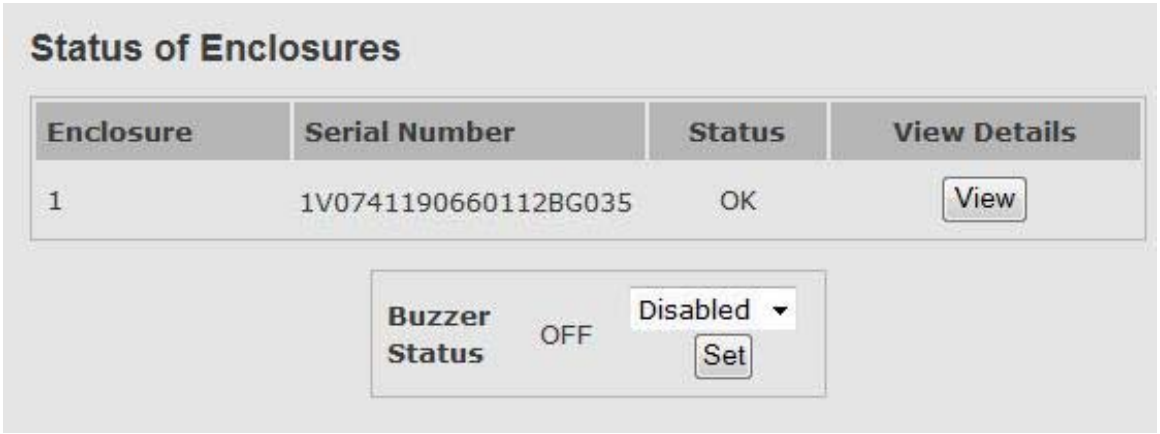
8.1 Enclosures

The **Monitoring → Enclosures** screen has two purposes:

1. It allows the user to view detailed information on a specific enclosure
2. It allows the user to set the buzzer to disabled, enabled or silenced

To view detailed information on a specific enclosure in the system (such as Temperature Probes, Voltage Sensors, Fans, Power Supply Units, and Battery Backup Units) the user just needs to click on the **View** button next to the enclosure of interest.

To modify the buzzer setting, the user can select from three options (disabled, enabled, silenced) on the Monitoring → Enclosures screen. To apply any changes just click the **Set** button.



Enclosure 1

Enclosure

Enclosure Id-S/N	1-1V0741190660112BG035
Controller 0	0000000003040287
Firmware	H016
Status Summary	OK

Controller 1

Controller Type	XXXXXXXXXXXX	**Controller S/N**	0000000003040287
Date & Time	27/11/2008 11:47:31	**Uptime**	00:000:00:09:54m
Firmware Revision	H016		
Cache Size (MB)	512		

Temperature Probes

Location	Temperature (Deg. C)	Threshold (Deg. C)	Status
Controller 1	31	65	OK
Bay 1	28	55	OK
Bay 2	28	55	OK
Bay 3	29	55	OK
Bay 4	30	55	OK
Bay 5	26	55	OK
Bay 6	26	55	OK
Bay 7	26	55	OK
Bay 8	27	55	OK
Bay 9	25	55	OK
Bay 10	25	55	OK
Bay 11	25	55	OK
Bay 12	25	55	OK

Voltage Sensors

Location	Volts	Status
Sensor 5	12.27	OK
Sensor 6	02.44	OK
Sensor 7	01.87	OK
Sensor 8	03.32	OK

Fans

Fan	Status
1	OK
2	OK

Power Supply Units

PSU	Status
1	OK
2	OK

Battery Backup Units

Battery Pack	Charging Progress	Status

8.2 Disks

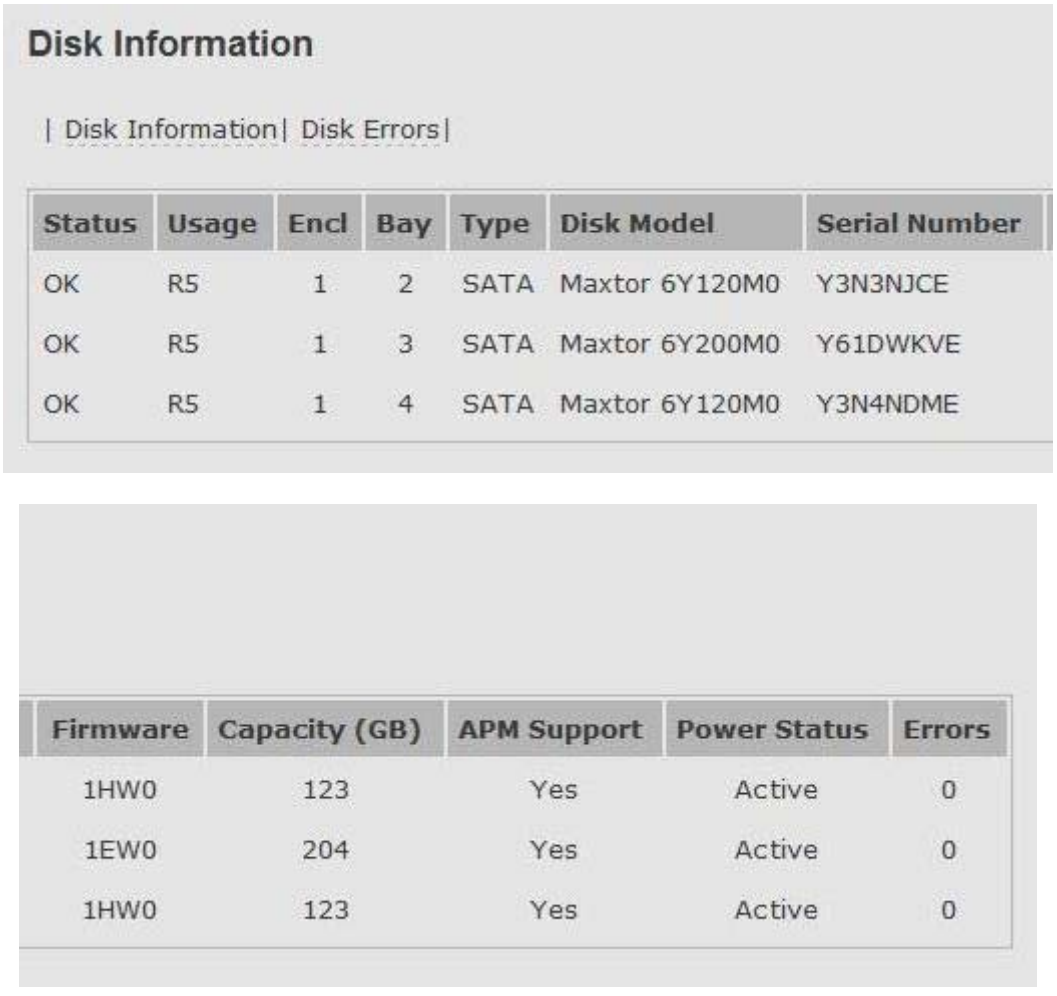
The **Monitoring ➔ Disks** screen is split into two parts:
1. Disk Information
2. Disk Errors

8.2.1 Disk Information

The Disk Information screen is a read-only screen and provides detail on all disks such as Status, Usage, Enclosure, Bay, Type, Disk Model, Serial Number, Firmware, Capacity, APM Support and Power Status.

The Disk Information screen also shows the total number of disk errors for each disk.

To see the breakdown of disk errors, the user has to navigate to the 'Disk Errors' screen (select the 'Disk Errors' tab).


Disk Information
| Disk Information | Disk Errors |
Status Usage Encl Bay Type Disk Model Serial Number
OK R5 1 2 SATA Maxtor 6Y120M0 Y3N3NJCE
OK R5 1 3 SATA Maxtor 6Y200M0 Y61DWKVE
OK R5 1 4 SATA Maxtor 6Y120M0 Y3N4NDME
Firmware Capacity (GB) APM Support Power Status Errors
1HW0 123 Yes Active 0
1EW0 204 Yes Active 0
1HW0 123 Yes Active 0

8.2.1.1 Disk Status

The Disk Status is defined by Disk_Usage and Access_Status:

Disk Usage:
0 Unassigned,
1 Part of a RAID,
2 Assigned Spare,
3 Global Spare

Disk Access Status Bitmap:
0 - OK
1 = At Risk
2= Broken
4 = Missing
0x80 = Unsupported

First Priority:
Disks which are actually present, regardless of whether they are part of a RAID, or a spare.
Access = 0, or 1, or 2 Usage = X

Second Priority:
Disks which are missing but part of a RAID.
Access = 4, Usage = 1

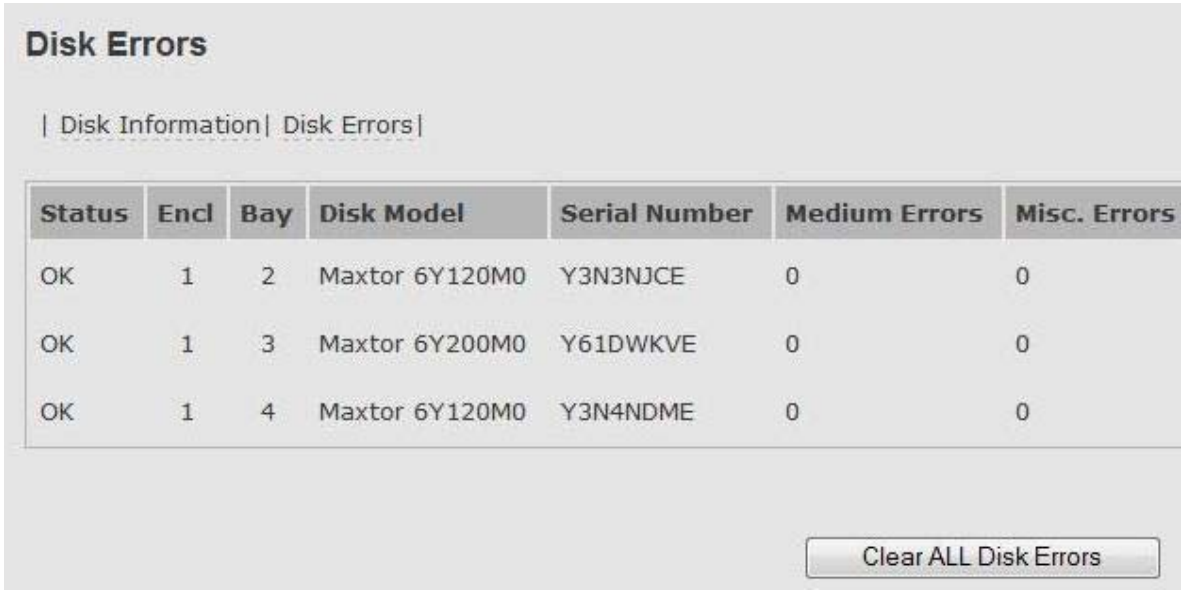
Third Priority:
Disks which are missing but are spares.
Access = 4 Usage = 2 or 3

Fourth Priority (Never displayed)
Disks which are missing and not part of a RAID or spare.
Access = 4 Usage = 0

NOTE: When selecting disks for RAID creation, expansion or selecting spares, never display Missing, Faulty or Broken disks, regardless of whether they are part of a RAID or spares.

8.2.2 Disk Errors

On this screen, user can see the breakdown of disk errors. The user can also choose to clear all errors for one individual disk (by clicking the **Clear** button in the row of the disk of interest). It is also possible to clear all disk errors of all the disks in the system. This can be achieved by clicking on **Clear All Disk Errors**.



8.3 Port Statistics

The **Monitoring ➔ Port Statistics** screen is a read-only screen and displays the link statistics for the system. Statistics are displayed for each port in each controller. It will show information such as Port Name, Node Name, Link Speed, Link Type, and number of Bad RX Chars, Bad CRC Chars, Link Down Count, Link Up Count, Aborted Commands, and Commands Timeout.

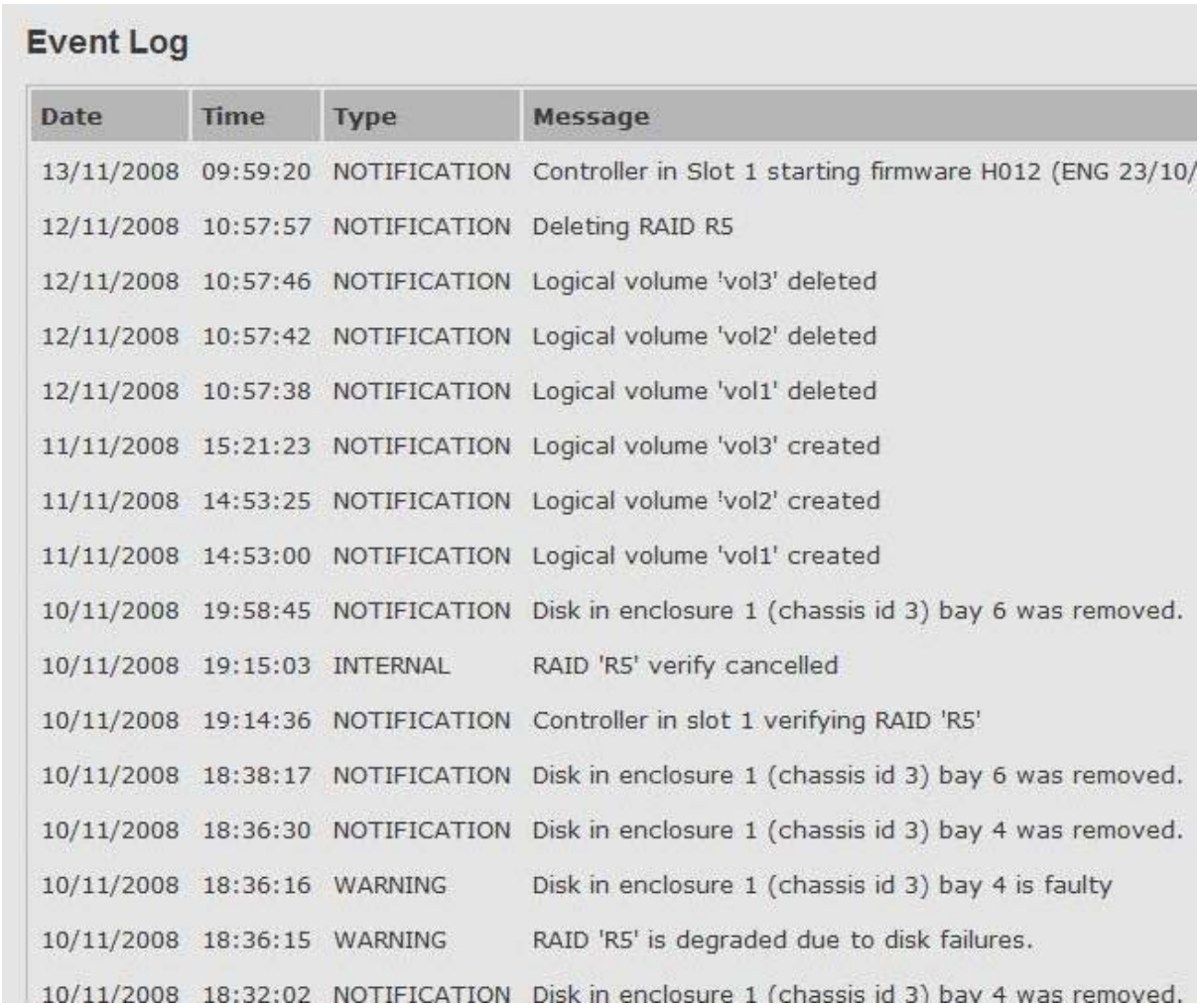
To reset Port Statistics information, use the **Reset Counters** button.

Port Statistics
Controller 1 1
Port A B
Port Name 20010017 2a350283 20020017 2a350283
Node Name 20000017 2a350283 20000017 2a350283
Link Speed 0 Gb 2 Gb
Link Type N/A Private Loop
Link State Down Up
Bad RX Chars 0 0
Bad CRC Chars 0 0
Link Down Count 0 0
Link Up Count 0 0
Aborted Commands 0 0
Commands Timeout 0 0
Reset Counters

8.4 Event Log

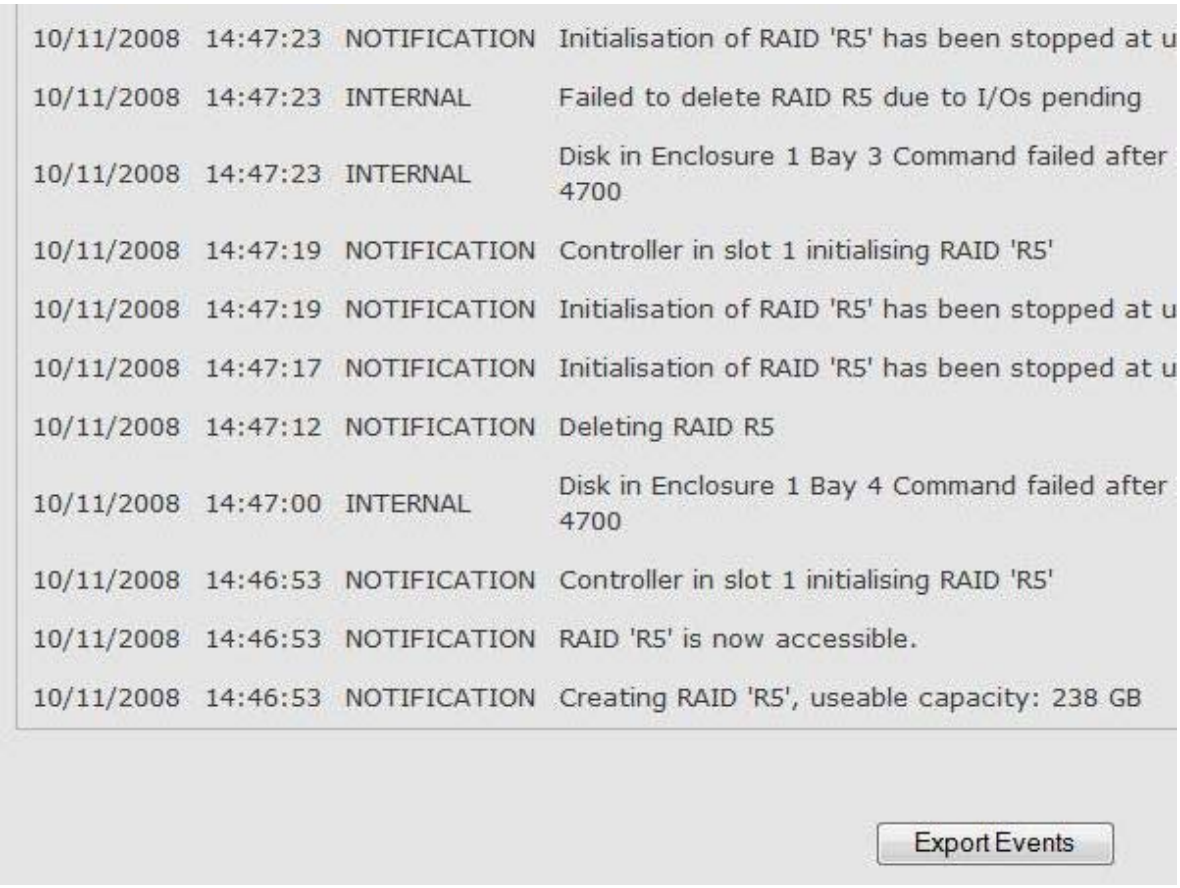
The **Monitoring ➔ Event Log** screen allows the user to view all events that have occurred in the system.

In addition, the user can choose to export a current snapshot of all the events that have occurred by clicking on the **Export Events** button. This will then prompt the user to save the export file as a html-file in a location as specified by the user.



Event Log

Date	Time	Type	Message
13/11/2008	09:59:20	NOTIFICATION	Controller in Slot 1 starting firmware H012 (ENG 23/10/
12/11/2008	10:57:57	NOTIFICATION	Deleting RAID R5
12/11/2008	10:57:46	NOTIFICATION	Logical volume 'vol3' deleted
12/11/2008	10:57:42	NOTIFICATION	Logical volume 'vol2' deleted
12/11/2008	10:57:38	NOTIFICATION	Logical volume 'vol1' deleted
11/11/2008	15:21:23	NOTIFICATION	Logical volume 'vol3' created
11/11/2008	14:53:25	NOTIFICATION	Logical volume 'vol2' created
11/11/2008	14:53:00	NOTIFICATION	Logical volume 'vol1' created
10/11/2008	19:58:45	NOTIFICATION	Disk in enclosure 1 (chassis id 3) bay 6 was removed.
10/11/2008	19:15:03	INTERNAL	RAID 'R5' verify cancelled
10/11/2008	19:14:36	NOTIFICATION	Controller in slot 1 verifying RAID 'R5'
10/11/2008	18:38:17	NOTIFICATION	Disk in enclosure 1 (chassis id 3) bay 6 was removed.
10/11/2008	18:36:30	NOTIFICATION	Disk in enclosure 1 (chassis id 3) bay 4 was removed.
10/11/2008	18:36:16	WARNING	Disk in enclosure 1 (chassis id 3) bay 4 is faulty
10/11/2008	18:36:15	WARNING	RAID 'R5' is degraded due to disk failures.
10/11/2008	18:32:02	NOTIFICATION	Disk in enclosure 1 (chassis id 3) bay 4 was removed.

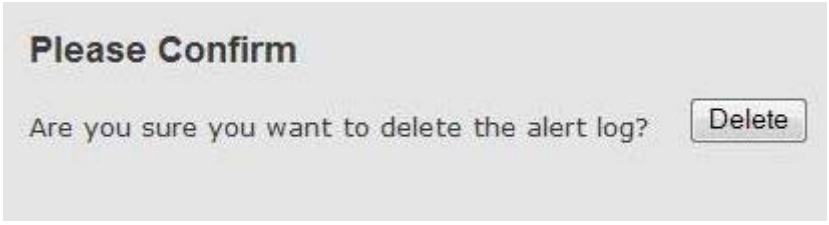


10/11/2008	14:47:23	NOTIFICATION	Initialisation of RAID 'R5' has been stopped at u
10/11/2008	14:47:23	INTERNAL	Failed to delete RAID R5 due to I/Os pending
10/11/2008	14:47:23	INTERNAL	Disk in Enclosure 1 Bay 3 Command failed after 4700
10/11/2008	14:47:19	NOTIFICATION	Controller in slot 1 initialising RAID 'R5'
10/11/2008	14:47:19	NOTIFICATION	Initialisation of RAID 'R5' has been stopped at u
10/11/2008	14:47:17	NOTIFICATION	Initialisation of RAID 'R5' has been stopped at u
10/11/2008	14:47:12	NOTIFICATION	Deleting RAID R5
10/11/2008	14:47:00	INTERNAL	Disk in Enclosure 1 Bay 4 Command failed after 4700
10/11/2008	14:46:53	NOTIFICATION	Controller in slot 1 initialising RAID 'R5'
10/11/2008	14:46:53	NOTIFICATION	RAID 'R5' is now accessible.
10/11/2008	14:46:53	NOTIFICATION	Creating RAID 'R5', useable capacity: 238 GB

Chapter 9 Administration

9.1 Clear Event Log

The **Administration ➔ Clear Event Log** screen allows the user to delete all events in the event log. Confirmation is required before any action is taken.



9.2 Port Setup

The **Administration → Port Setup** screen allows you to view the current port configurations. The default port settings should be sufficient for most standard configurations. However, you may need to change them if you encounter problems with your configuration.

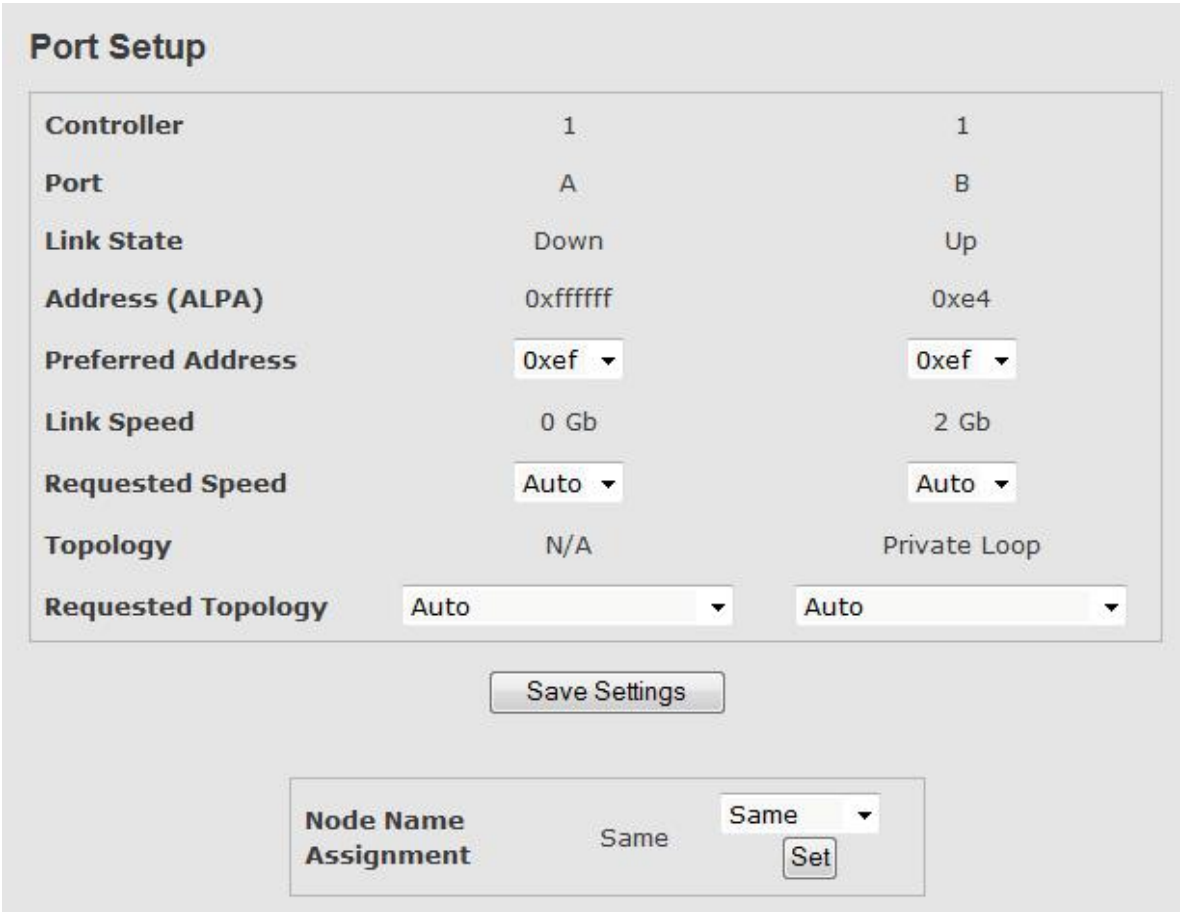
Each controller has two ports, which can either be connected directly to host HBAs or via FC switch to the host systems. Each port can be configured with different settings. They can negotiate different link speeds, ALPAs and requested topology. Same or different Node Name for all the ports in the system can also be configured.

Steps to configure Port Setup:

1. On the **Administration → Port Setup** screen, configure the Preferred Address, Requested Speed, or Requested Topology as needed.

2. Click on **Save Settings** to save the changes.

3. To configure Node Name Assignment, select "Same" or "Different" then click **Set**.

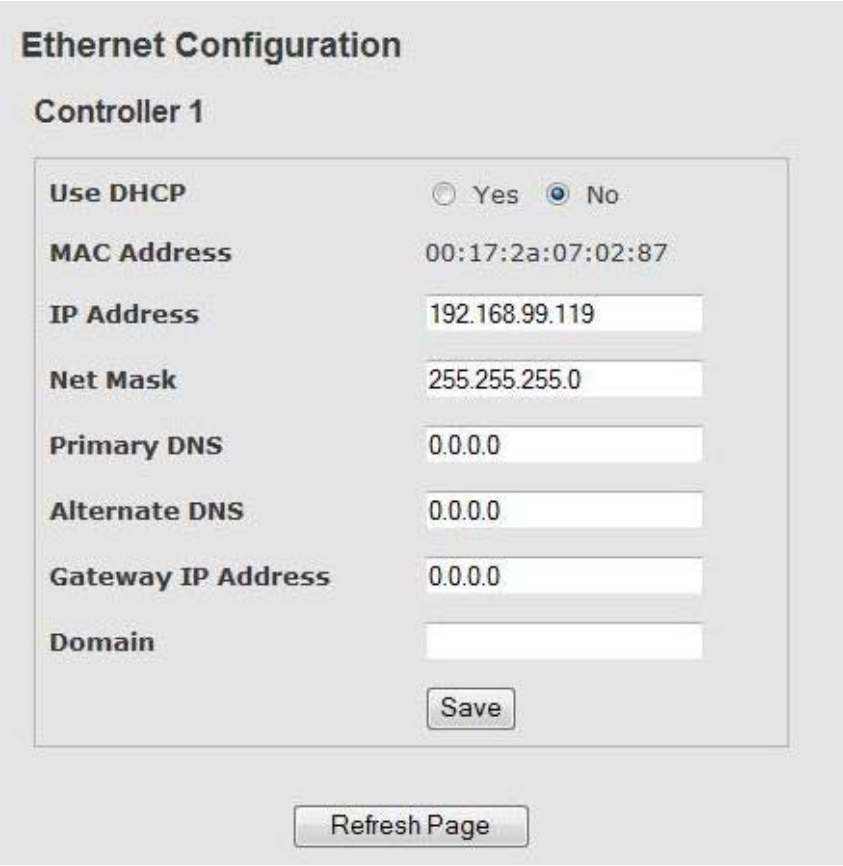


This screen contains the following details and options:

Field	Description
Controller	The ID of the controller that the port is located on.
Port	ID of the port, they are indexed A and B.
Link State	The connection state of the port. This can be either Up or Down.
Address (ALPA)	Represents the ID of the controller's port when connected to the SAN. This may be different to the preferred ALPA (Arbitrated Loop Physical Address) if it is not possible for the system to retrieve the requested ALPA when it is connected to the SAN. In fabric and point-to-point mode this field is referred to as Address. In loop mode it is ALPA.
Preferred Address	Preferred ALPA that the port on the controller would like to use. The preferred ALPA is only valid in loop mode. A list of available addresses is listed in a drop down box.
Link Speed	Current link speed of the connection to the port on the controller.
Requested Speed	Preferred link speed of the connection to the port on the controller. The actual link speed may be different to this value as this is negotiated between the controller and the HBA it is connected to.
Topology	Displays the connection type of fibre channel connection of the port. The options are: • Private loop (NL Port) • Public loop (NL Port) • Point to point (N Port) • Fabric (N Port) • Non Participating.
Topology - Requested	The topology of the SAN to which the port will be connected. The options are: • Auto • Loop only (NL Port) • Point-to-point/Fabric (N Port)
Save Settings	Save the port settings on the screen.
Node Name Assignment	The user can choose between assigning the same node name for all of the ports in the system or assigning different node names. Facilitates Mac OS X compatibility.

9.3 Ethernet Configuration

The **Administration →Ethernet Configuration** screen allows you to view and change the IP connection settings of the system.



Steps to configure Ethernet:

1. On the **Administration → Ethernet Configuration** screen, configure the system whether to use DHCP or not. If not, configure the IP Address, Net Mask, Primary DNS, Alternate DNS, Gateway IP Address, and Domain as necessary.

2. Click **"Save"** to save the IP connection information of the selected controller. The screen can be updated with the "**Refresh Page"** button.

This screen contains the following details and options:

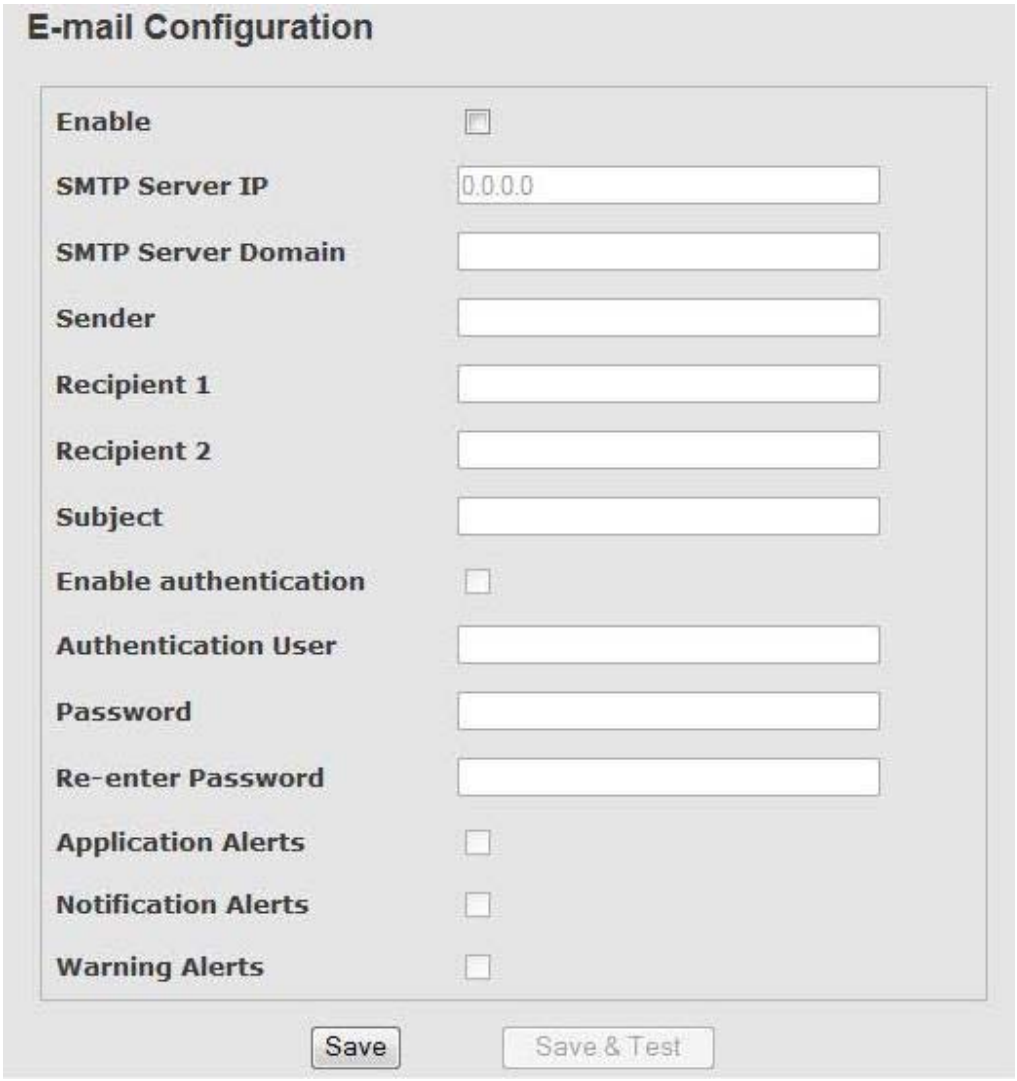
Field	Description
Use DHCP	If DHCP is enabled on the network, we recommend that you use it to dynamically assign the IP address. If it is disabled, you must enter the static IP configuration in the fields below.
MAC Address	The hardware address of the controller.
IP Address	The IP address assigned to the system. Alerts will be sent from this IP address. This is also the IP address that can be used to access the Raid Manager GUI in a Web browser.
Net Mask	A 32-bit mask that shows how an internet address is divided on the network. Set this value to the current settings of the network.
Primary DNS	The IP Address of the DNS Server that the system uses to resolve host names. At least one IP Address is required if DNS is to be used for name resolution. You must set this up if a host name is entered in the 'E-mail Server Address' field in the 'Email Event Configuration' screen.
Alternate DNS	Alternate DNS server to use for name resolution if the primary server is unavailable.
Gateway IP Address	IP address that enables communication between computer networks that may (or may not) use different protocols. Set this value to the current settings of the network. If the Gateway IP Address is not set correctly, the GUI will encounter problems connecting to a system through a firewall.
Domain	Domain name of the organisation where the system resides.

NOTE: All systems will be configured with DHCP enabled by default. The IP address should be detected automatically when connecting to the network.

9.4 Email Event Configuration

The A**dministration → Email Event Configuration** screen allows you to set up alert notifications for the system.

You can have alerts sent to a mobile phone or other SMS compatible device by using a third party product that converts the SMTP messages to SMS and then redirects them to the SMS compatible device. If you use this, the SMTP messages should be sent to the e-mail address provided by the third party provider.



Steps to setup Email Event Configuration:

1. On the **Administration → Email Event Configuration** screen, check "Enable" option to enable SMTP.
2. Configure the SMTP Server IP, SMTP Server Domain, Sender, Recipient(s), and Subject as necessary.
3. If needed, check the "Enable authentication" option, and enter in "Authentication User" the username of the user who will authenticate the

e-mail settings, and enter in the "Password" and "Re-enter Password" test boxes the password of the user who will authenticate the e-mail settings.

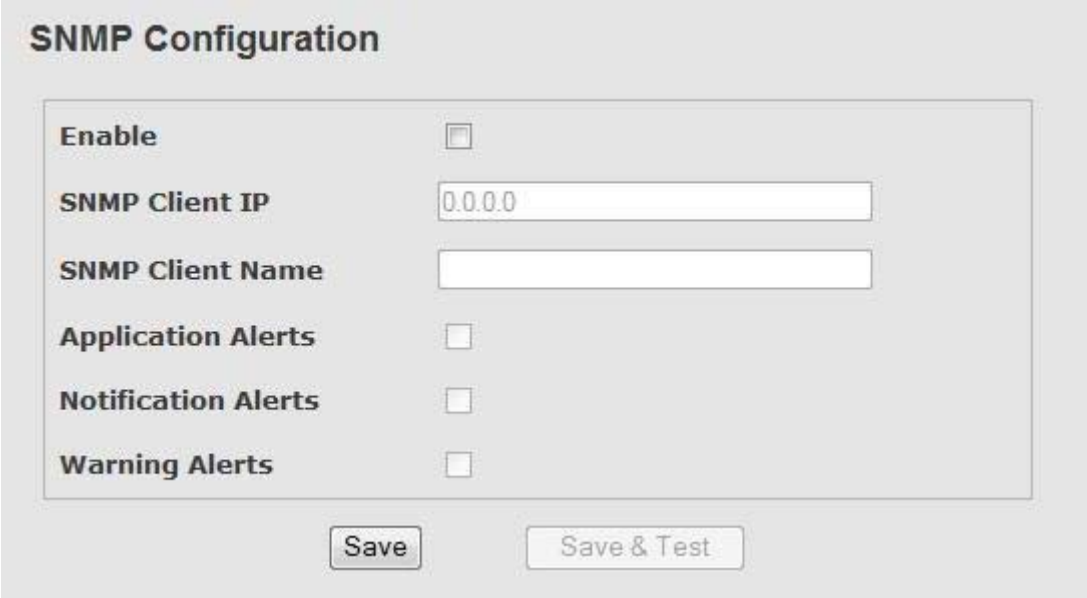
4. Select the type of alerts that will be sent via e-mail.
5. Click "**Save"** to apply the changes to the controller, or click **"Save & Test"** to apply the changes to the controller and send a test message.

This screen contains the following details and options:

Field	Description
Enable	Tick the check box to enable SMTP.
SMTP Server IP	Mail server where the SMTP account was created. The server name can be used if a valid Primary DNS or Alternate DNS is entered in the IP Connection screen.
SMTP Server Domain	The Domain of the mail server where the SMTP account was created. The server name can be used if a valid Primary DNS or Alternate DNS is entered in the 'Ethernet Configuration' screen.
Sender	E-mail address of the system sending the e-mail, i.e. the e-mail address assigned to the account used to administer the application.
Recipient 1	E-mail address of the first person receiving the e-mail.
Recipient 2	E-mail address of a second person receiving the e-mail.
Subject	Text that will be displayed in the subject field of an Alert e-mail.
Enable Authentication	The mail server may require SMTP authentication. It is used as a security mechanism to prevent members of an ISP from spamming mailboxes on the network. If the check box is selected then this option is enabled and a user name and password are required to authenticate the SMTP configuration.
Authentication User	Enter the username of the user who will authenticate the e-mail settings.
Password	Enter the password of the user who will authenticate the e-mail settings.
Re-enter Password	Re-enter the password of the user who will authenticate the e-mail settings.
Application Alerts	Alerts generated by the GUI will be sent via e-mail when they occur.
Notification Alerts	Information events in the Event Log will be sent via e-mail when they occur.
Warning Alerts	Warning events in the Event Log will be sent via e-mail client when they occur.

9.5 SNMP Configuration

The **Administration → SNMP Configuration** screen allows you to set up SNMP alert notifications for the system.



Steps to setup SNMP Configuration:

1. On the **Administration → SNMP Configuration** screen, tick the "Enable" check box to enable SNMP.

2. Enter the SNMP Client IP, SNMP Client Name, and select the type of alerts to be sent via SNMP.

3. Click **"Save"** to apply the changes to the controller, or click **"Save & Test"** to apply the changes to the controller and send a test message.

This screen contains the following details and options:

Field	Description
Enable	Tick the check box to enable SNMP.
SNMP Client IP	IP address of the SNMP client system.
SNMP Client Name	Host name of the SNMP client system. The SNMP name can be used if a valid Primary DNS or Alternate DNS is entered in the 'Ethernet Configuration' screen.
Application Alerts	Alerts generated by the GUI will be sent via SNMP when they occur.
Notification Alerts	Information events in the Event Log will be sent via SNMP when they occur.
Warning Alerts	Warning events in the Event Log will be sent via SNMP when they occur.

9.6 Change Password

The **Administration ➔ Password** screen allows you to change the password used to log into the system. The name of the administrator user is 'admin'. This cannot be changed. The default password for the administrator user is 'admin'. We recommended that you change this password.

This screen contains the following details and options:

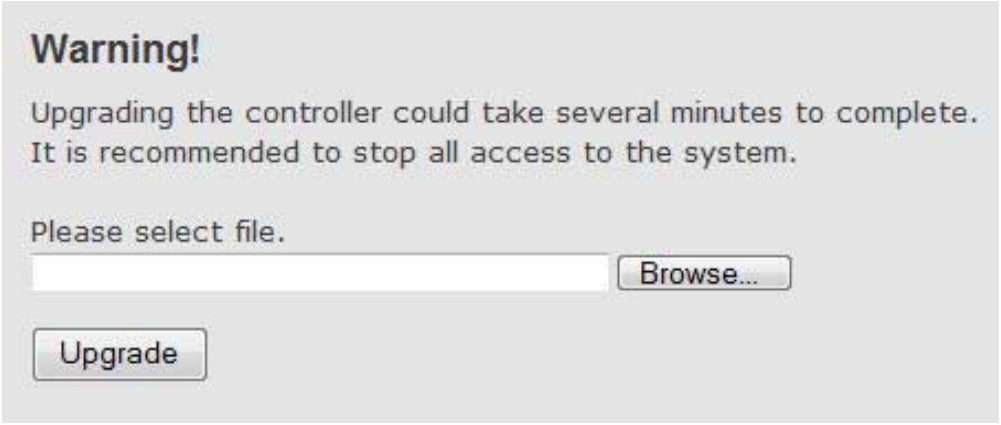
Field	Description
Username	Username used to monitor and manage the system.
Current Password	Password currently used by the system.
New Password	Enter password that you want to change to.
Confirm Password	Re-enter password that you want to change to.
Save Password	Save the new password.

9.7 Update Firmware

The **Administration ➔Upgrade Firmware** screen allows new firmware to be installed on the system.

Steps to Update Firmware:

1. In the **Administration ➔Upgrade Firmware** screen, click **'Browse'** and select the file containing the firmware.
2. The installation will begin when the **'Upgrade'** button is clicked.
3. Do **not** perform any other actions until a message is displayed confirming that the installation is finished.
4. If a system reset is needed to run the new firmware, you will be prompted to do so at this point.


Warning!
Upgrading the controller could take several minutes to complete.
It is recommended to stop all access to the system.
Please select file.
Browse...
Upgrade

WARNING: This facility should only be used under the direction of our technical support team.

WARNING: Upgrading the controller could take several minutes to complete. It is recommended to stop all access to the system.

9.8 Reset Controller

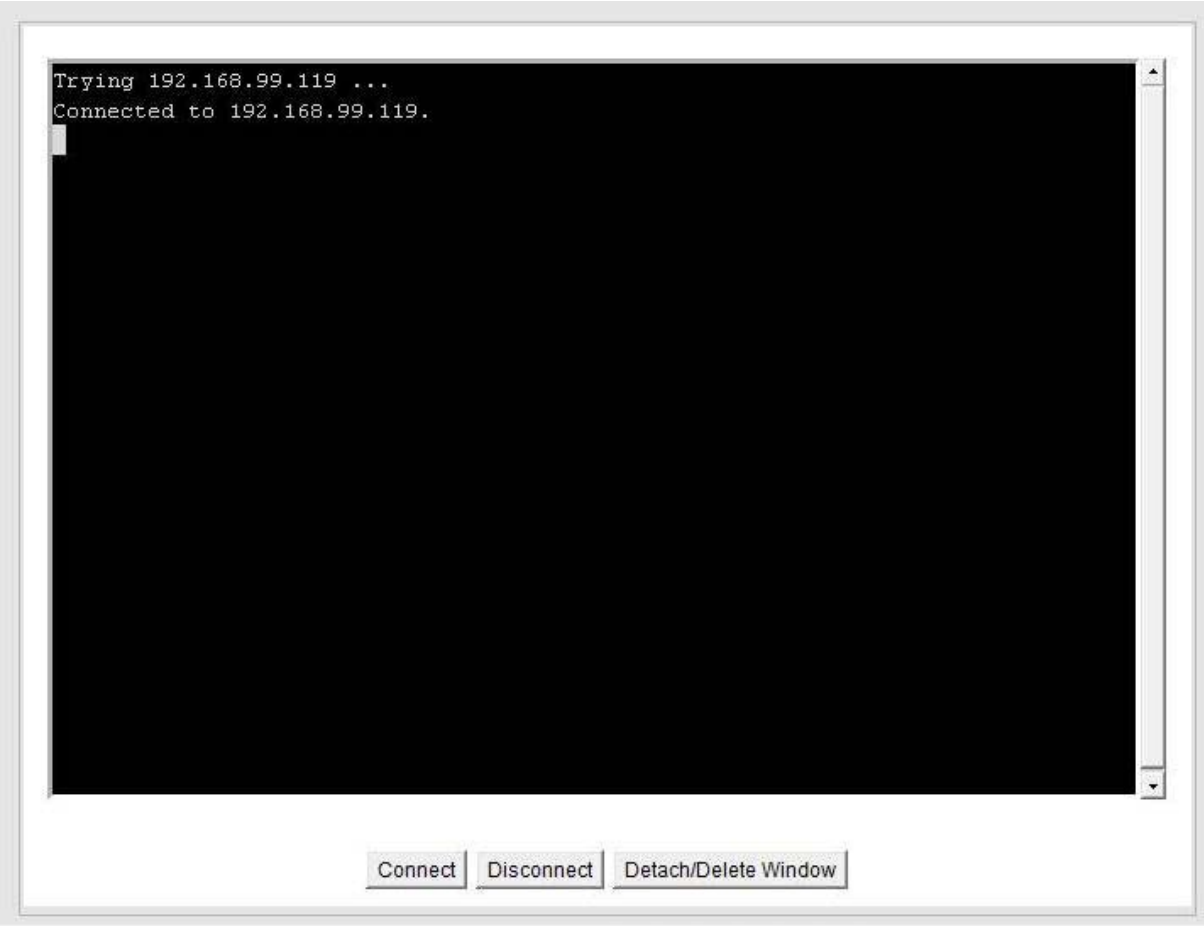
The **Administration ➔ Reset Controller** screen allows the user to reset one or more of the system's controllers. Using the dropdown box, select which of the controllers the action should apply to. Then click the **'Reset Now'** button to begin the reset.

In a dual controller system, if **'Both Controllers'** are selected from the dropdown box and **'Reset Now'** button is clicked, the two controllers are reset sequentially. In this way the system's Logical Volumes remain accessible for the duration of the reset.

9.9 Telnet

The **Administration ➔ Telnet** screen allows the user to interact with the controller via a command line interface.

A working Java plug-in for your browser is required to use this facility.



Warning: The telnet applet should only be used under the direction of our technical support team.

9.10 Config Save/Restore

The **Administration ➔ Config Save/Restore** screen can be used to restore a backup controller configuration.

Restore Configuration on Disk
Restore COD
Note: The Restore COD function will destroy all RAID configurations currently stored on your controller. This action will also cause the controller to reset.
Manual Save and Restore of Configuration
Configuration 1
Save
Restore
Configuration 2
Save
Restore

This screen contains the following buttons:

Field	Description
Restore COD	Restores an automatically saved configuration from the disks currently available in the enclosures. The system will reset itself when the restoration is complete.
Save	Downloads one of two saved system configurations.
Restore	Prompts the user for the location of a previously saved configuration. The system will need to be reset for the restored configuration to take effect.

Warning: This facility should only be used under the direction of our technical support team.

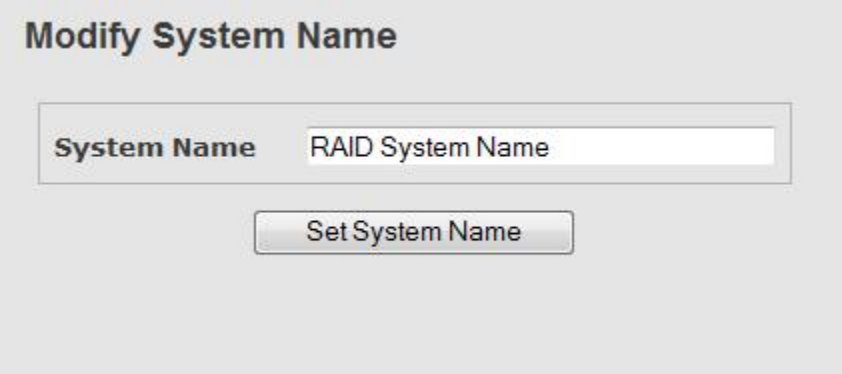
9.11 Export Status

The **Administration ➔ Export Status** screen allows the user to download a zip file containing a snapshot of HTML status screens. This information can be used by our technical support team when debugging problems.

9.12 System Name

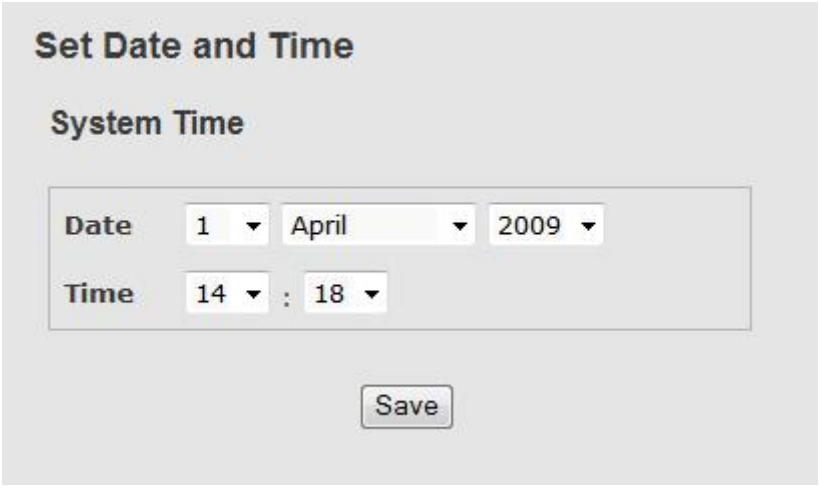
The **Administration ➔ System Name** screen allows you to modify the name of the system.

Change the value in the System Name text field and click on the **Set System Name** button for the update to take effect.



9.13 Set Date and Time

The **Administration ➔ Set Data and Time** screen allows you to set the date and time of the system.



This screen contains the following details and options:

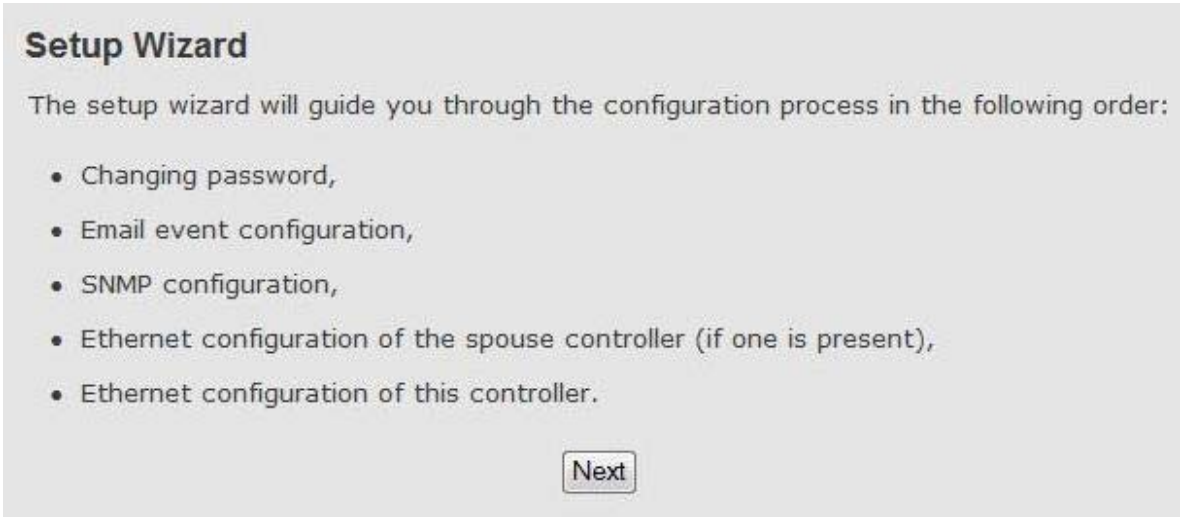
Field	Description
Date	Set the date for the controller.
Time	Set the time for the controller.
Save	Saves the new settings.

9.14 Setup Wizard

The setup wizard (**Administration ➔ Setup Wizard**) guides the user through the following configuration screens:

- **Change Password**
- **Email Event Configuration**
- **SNMP Configuration**
- **Ethernet Configuration** for each controller that is currently inserted.

Click **'Next'** to save any configuration changes and move to the next screen. Clicking **'Previous'** will display the previous screen.


Setup Wizard
The setup wizard will guide you through the configuration process in the following order:
Changing password,
Email event configuration,
SNMP configuration,
Ethernet configuration of the spouse controller (if one is present),
Ethernet configuration of this controller.
Next

Chapter 10 Troubleshooting

10.1 Alerts

The following table summarizes the operation of the system in the presence of various failures:

Failure Class	Failure Type	Effect on Data	Effect on Availability	Effect on Performance	User Notification
Power (BBU Not present)	Total Loss	Data may be lost if write cache is enabled	System unavailable	N/A	Event log
Power (BBU Not present)	Transient Loss	Data may be lost if write cache is enabled	System unavailable during power loss. Controller takes 7 seconds to reboot and 60 seconds for the system to become available.	N/A	Event log
Power (BBU Present)	Total Loss	No effect provided outage is shorter than BBU hold time	System unavailable	N/A	Event log
Power (BBU Present)	Transient Loss	No effect	System unavailable during power loss. Controller takes 7 seconds to reboot and 60 seconds for the system to	N/A	Event log

			become available.		
Disk (RAID Level 1, 5 or 10)	Drive removed or drive failure	No effect. RAID volume degraded.	Loss of high availability. System will become unavailable on second failure	Performance may drop	Event log and E-mail
Disk (RAID Level 0)	Drive removed or drive failure	RAID is inaccessible	RAID unavailable	N/A	Event log and E-mail
Disk (RAID Level 1, 5 or 10)	Medium Error	No effect	Stripe will be rebuilt on alternate sectors.	Performance may drop	Disk statistics updated in controller If threshold met, Event log and E-mail
Disk (RAID Level 0)	Medium Error	Data loss	None except for the data loss	None	Disk statistics updated in controller If threshold met, Event log and E-mail
Cable	SCSI cable total failure	No effect	System unavailable unless alternate SCSI path is used in cluster configuration.	N/A	Event log and E-mail
Cable	SCSI cable transient parity errors	No effect	System remains available	Performance will drop as command timeouts, bus resets and retries occur	Event log and E-mail

Backplane (RAID Level 1, 5 or 10)	SATA link failure	No effect RAID volume degraded	Loss of high availability, system may become unavailable on second failure	Performance may drop.	Event log and E-mail
Backplane (RAID Level 0)	SATA link failure	RAID is inaccessible	RAID unavailable	N/A	Event log and E-mail
Backplane (RAID Level 1, 5 or 10)	SATA link degraded	No effect	No effect	Performance may drop.	Disk statistics updated in controller If threshold met, Event log and E-mail
Backplane (RAID Level 0)	SATA link degraded	No effect	No effect	Performance may drop.	Disk statistics updated in controller If threshold met, Event log and E-mail
Enclosure	Fan Failure	No effect	System availability at risk until fan replaced	No effect	Event log and E-mail
Enclosure	PSU module failure	No effect	System availability at risk until PSU module replaced	No effect	Event log and E-mail
BBU	BBU failure	No effect	User data at risk from transient power failure if write caching is	No effect	Event log and E-mail

			enabled.		
Controller	Hardware failure	User data loss is possible	System unavailable	N/A	Event log
Controller	Software failure, controller reboot	No effect User data is maintained in cache during controller reboot	System is unavailable during controller reboot. Controller takes 7 seconds to reboot and 60 seconds for the system to become available.	Performance may drop if command timeouts occur.	Event log and E-mail

NOTE: E-mail refers to an e-mail notification sent by the controller over the Ethernet interface to an assigned e-mail address. Event log refers to an event logged in the Event Log in the Raid Manager Web Application.

10.2 Alert Messages

The controller sends the following Notifications and Warnings.

10.2.1 Notifications

NOTE: The Alert Messages displayed here are example Alert Messages.

Notification Message	Action to be taken
Normal operation of power supply in slot <number> restored	For information purposes only, no immediate action necessary.
Normal operation of fan in slot <number> restored	
The temperature in the system is now within the acceptable range	
Creating RAID '<name>', useable capacity: <capacity> GB	
RAID '<name>' is now accessible	
Initialising RAID '<name>'	
Initialization of RAID '<name>' deferred for a higher priority RAID	
RAID '<name>' initialization complete	
Deleting RAID '<name>'	
Expanding RAID '<name>' by adding rows	
Expanding RAID '<name>' by adding <number of columns> column(s)	
Initialising expansion space on RAID '<name>'	
RAID '<name>' expand complete	
Rebuild of RAID '<name>' deferred for a higher priority RAID	
RAID '<name>' rebuild complete	

Disk in bay <number> is no longer part of RAID '<name>'	
Verifying RAID '<name>'	
Verification of RAID '<name>' deferred for a higher priority RAID	
RAID '<name>' verification complete	
Logical volume '<name>' created	
Logical volume '<name>' deleted	
Logical volume '<name>' capacity expanded to <capacity>	
Logical volume '<name>' ID:LUN changed to <SCSI ID>:<LUN>	
Logical volume '<name>' changed to '<new name>'	
Starting Firmware <version> (<build time and date>) reboot <reboot count>	
Network up at IP address <IP address>, netmask <netmask>	

10.2.2 Warnings

NOTE: The Alert Messages displayed here are example Alert Messages.

Notification Message	Action to be taken
Disk in bay <number> has excessive errors	Backup data, schedule a disk replacement.
Disk in bay <number> is running out of reallocation blocks	Backup data, schedule a disk replacement.
Disk in bay <number> has run out of reallocation blocks	Backup data, schedule a disk replacement.
Disk in bay <number> has failed	Backup data, schedule a disk replacement.
Disk in bay <number> is missing	Check to see if a rebuild is in progress for the effected RAID. Reseat the missing disk. Backup data, schedule a disk replacement.
Power Supply Module in slot <number> is not working properly	Reseat the power cord on both ends. Verify that power is being supplied from the power socket. Schedule a PSU module replacement.
Fan in slot <number> is not working properly	Schedule a fan module replacement.
NVRAM battery is exhausted and needs replacement	Schedule NVRAM Battery replacement.
NVRAM checksum invalid, restoring default settings	No action required, occurs immediately after the battery has been replaced.
The serial number on this system is incorrect	Occurs immediately after the battery has been replaced, controller serial number needs to be entered by service engineer. Call Tech Support for help.
The temperature in the system has	Ensure that all the disk bays have either disks or

exceeded <threshold value> threshold	dummy shuttles installed. Cool the room containing the system.
The temperature in the system has dropped below 10C/50F	Heat the room containing the system.
RAID <name> rebuild failed to complete	Usually followed by another warning indicating reason. Follow action for the other warning.
RAID <name> initialization failed to complete	Usually followed by another warning indicating reason. Follow action for the other warning.
RAID <name> verify failed to complete	Usually followed by another warning indicating reason. Follow action for the other warning.
RAID <name> expand failed to complete	Usually followed by another warning indicating reason. Follow action for the other warning.
RAID <name> is degraded due to disk failures	Backup data, schedule a disk replacement.
RAID <name> is inaccessible due to disk failures	Schedule multiple disk replacements. Restore data from last backup.
RAID <name> has no spare available	Assign a spare disk to the RAID.
Cannot start scheduled verify on RAID <name>	If RAID is Initialising, rebuilding, or expanding, verify will run on next scheduled verify. Otherwise backup data, schedule disk replacement.
Controller hardware error	Schedule controller replacement.
Firmware ID does not match; the binary is not for this product	Get correct firmware and download to controller.
Firmware download checksum failed, the binary may be corrupted	Get a different firmware file and download to controller.

An attempt to write Flash memory failed	If upgrading firmware, retry upgrade. Schedule controller replacement.

Appendix

1. How to Upgrade the Controller to Firmware 1.3x from Old Firmware Version

NOTE: Since firmware version 1.3x has larger binaries, it is required to upgrade first to 1.21 (bridge firmware) before upgrading to 1.3x, if your firmware is 1.20 or older.

Please install the correct proRAID Manager version for each firmware. See table below for the proRAID Manager and Firmware versions needed to be installed.

Table of Recommended Versions to be installed:

Controller Firmware	Expander Firmware	proSES Firmware	proRAID Manager
1.10	v379	1.13	1.5.25
1.11	v379	1.13	1.5.25
1.20	v388	1.16	1.5.34
1.30	v389	1.18	1.5.35 (**support Web GUI**)
1.31	V407	1.19	1.5.37 (**support Web GUI**)
1.33	V410	1.23	1.5.37 (**support Web GUI**)

Rules for Upgrading Firmware to Version 1.3x:

- Uninstall current version of proRAID Manager, then install the new version of proRAID Manager
- Upgrade proSES Firmware
- Power off then power on the subsystem
- Upgrade Controller with Bridge Firmware 1.21
- Reset Controller
- Upgrade Expander Firmware and wait 4 Minutes
- Power off then power on the subsystem
- Upgrade the Bottom Board Expander Firmware
- Upgrade Controller Firmware to Web GUI Version 1.3x
- Power off then power on the subsystem

NOTE: Please stop all IO operations to the RAID subsystem while upgrade takes place.

Controller Firmware Upgrade Table:

For SATA Disks:

To / From	1.11	1.20	1.30	1.31	1.33	Remarks
1.01	**OK**	**OK**	**1.21 →1.30 OK**	**1.21→1.31 OK**	**1.21→1.33 OK**	From 1.01 to 1.20 or 1.21; need to reassign IP
1.07	**OK**	**OK**	**1.21 →1.30 OK**	**1.21→1.31 OK**	**1.21→1.33 OK**	V3 controller
1.09	**OK**	**OK**	**1.21 →1.30 OK**	**1.21→1.31 OK**	**1.21→1.33 OK**	V3 controller
1.10	**OK**	**OK**	**1.21 →1.30 OK**	**1.21→1.31 OK**	**1.21→1.33 OK**	V3 controller
1.11	No Need	**OK**	**1.21 →1.30 OK**	**1.21→1.31 OK**	**1.21→1.33 OK**	V3 controller
1.20	**Not Approved**	No Need	**1.21 →1.30 OK**	**1.21→1.31 OK**	**1.21→1.33 OK**	V3 controller V4 controller
1.30	**Not Approved**	**Not Approved**	No Need	**OK**	**OK**	V3 controller V4 controller
1.31	**Not Approved**	**Not Approved**	**Not Approved**	No Need	**OK**	V3 controller V4 controller

Legend:

OK - Upgrade from current firmware to target firmware is approved
No Need - Upgrade from current firmware to target firmware is not needed
Not Approved - Upgrade from current firmware to target firmware is not approved

Detailed Steps for Upgrading Firmware to Version 1.3x:

1. Uninstall current version of proRAID Manager.
   A. Go to the installation directory of proRAID Manager and run the Uninstall program.

2. Install the new proRAID Manager version **1.5.37**.
   A. Insert install CD.
   B. Select the proRAID Manager version for your OS and download the installation files.
   C. Run the install program Install.exe.

3. Upgrade the proSES Firmware.

   Check proSES board version installed in your system. Each proSES board version is upgraded differently. PRO-90-6601 is SES version 1 and PRO-90-5601 is SES version 2. The LCD will display "SES" for SES version 1 (PRO-90-6601) and "SES2" for SES version 2 (PRO-90-5601).

   Another way to check proSES board version is to remove the SES module (need to power off the system) and check the version labeled on the PCBA.

PRO-90-5601 Ver: 2.x
Terminal Settings: 115200, 8, N, 1, N

PRO-90-6601 Ver: 1.x
Terminal Settings: 38400, 8, N, 1, N

For SES2 board PRO-90-5601:

a. To upgrade proSES firmware, connect RS232 cable (Phone-Jack to DB9) from RS232 port of SES module to available serial port of your PC.

b. Open "HyperTerminal" in your Windows PC and setup as follows:

Settings	
Baud Rate	**115200 (for SES board PRO-90-5601)**
Data Bits	**8**
Parity	**None**
Stop Bits	**1**
Flow Control	**None**

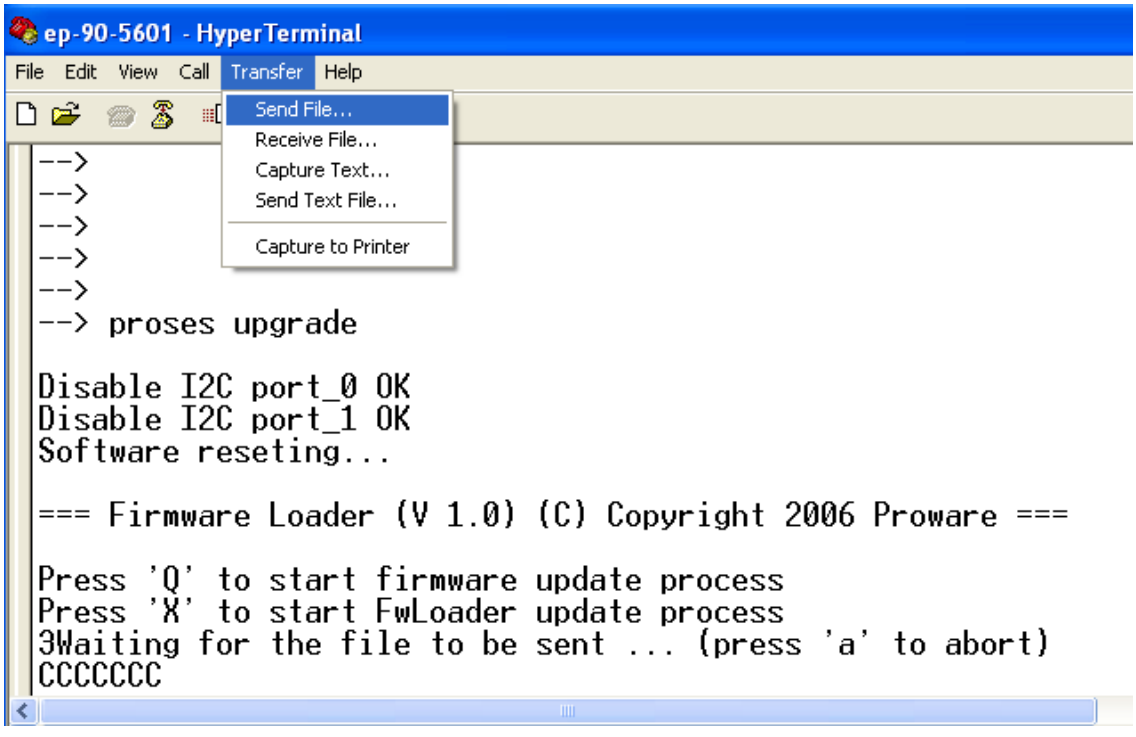
c. To access the SES console, press <ENTER> at least once to verify the SES console session has been established (a "-->" prompt should appear if configured properly).

d. At the prompt, type "**proses upgrade**", followed by <ENTER>.

```
--> proses upgrade_
```

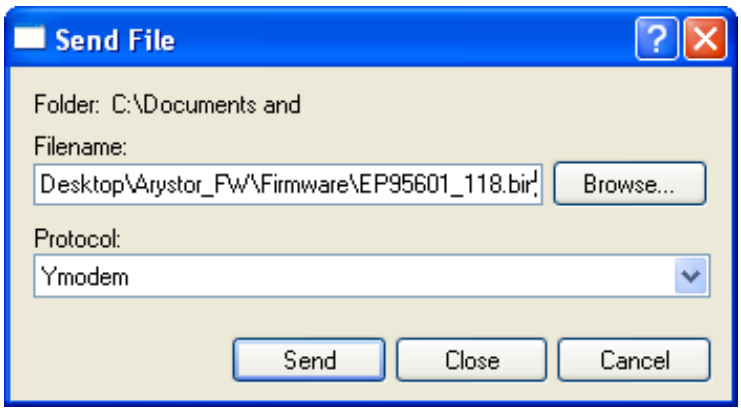
e. Press "Q" and there will be CCCC letters displayed.

f. Go to the "**Transfer**" menu at the top of the HyperTerminal window, and select the "**Send File...**" option.

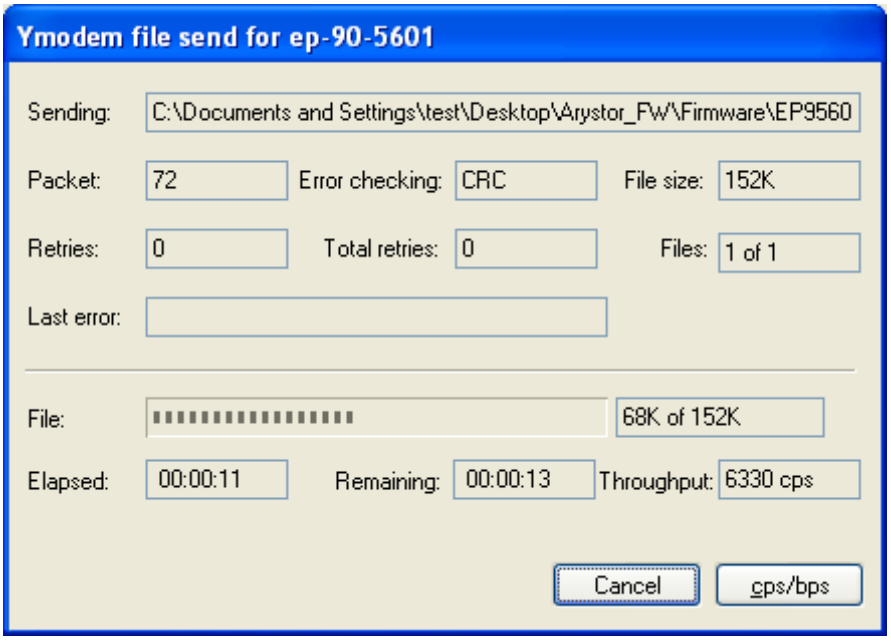

ep-90-5601 - HyperTerminal
File Edit View Call Transfer Help
Send File...
Receive File...
Capture Text...
Send Text File...
Capture to Printer
--> proses upgrade
Disable I2C port_0 OK
Disable I2C port_1 OK
Software reseting...
=== Firmware Loader (V 1.0) (C) Copyright 2006 Proware ===
Press 'Q' to start firmware update process
Press 'X' to start FwLoader update process
3Waiting for the file to be sent ... (press 'a' to abort)
CCCCCCC

g. In the Send File message box, select "**Ymodem**" from the Protocol pull-down menu.

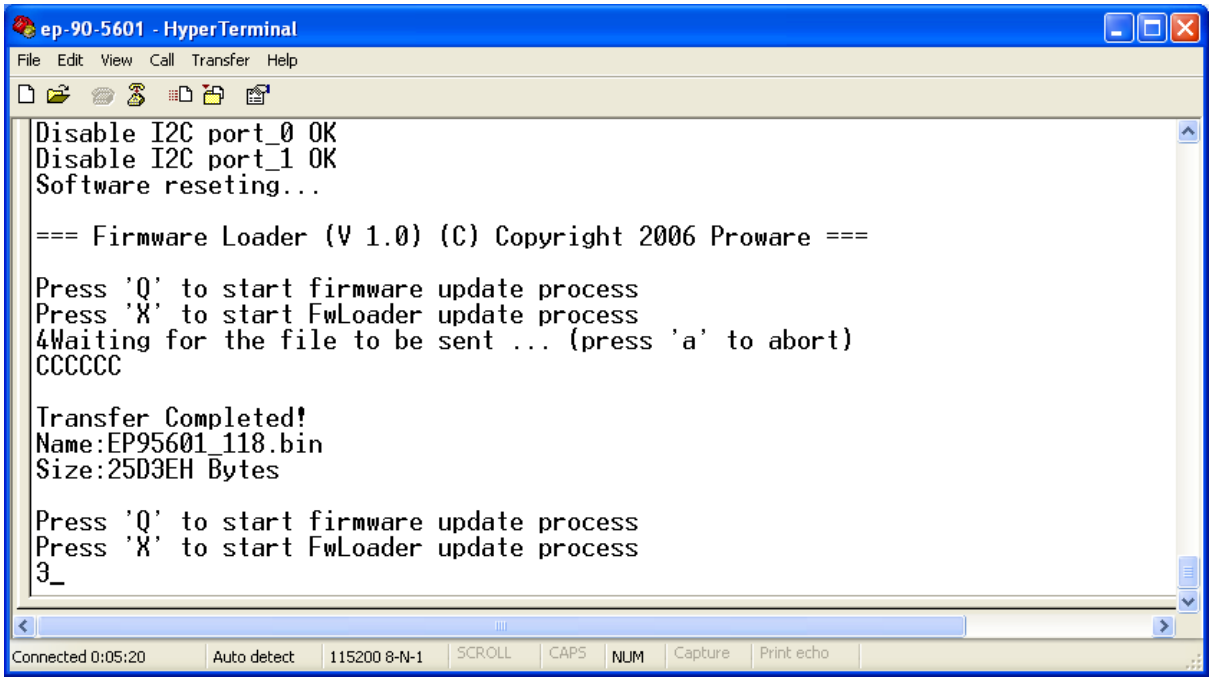
h. Select the "**Browse...**" button and locate the new firmware image file. Select firmware file "**EP95601_118.bin**" and click "Open".



i. Click "Send" to start upgrade process. The upgrade process will be shown.



j. Check if firmware upgrade is completed successfully.

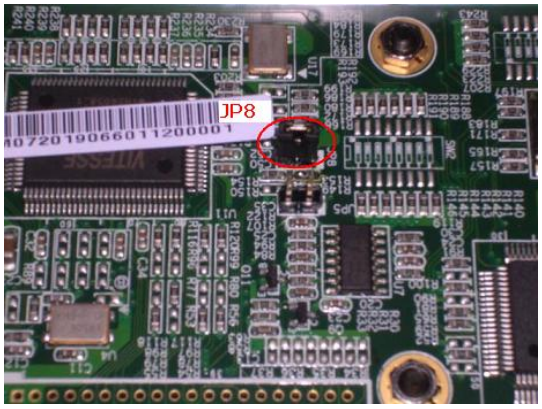


k. Use LCD panel to check if the new SES firmware has been updated. Use arrow down key until you see "SES2" and its firmware version.

For PRO-90-6601 SES board:

NOTE: The upgrade process is done twice. The first time needs a jumper in JP8. The second time does not need a jumper.

a. Power off the RAID system. Remove the SES Module. Insert a jumper in JP8 of SES board PRO-90-6601.



b. Insert the SES module into the RAID subsystem. Power on RAID subsystem.

c. Connect RS232 cable (Phone-Jack to DB9) from RS232 port of SES module to available serial port of your PC.

d. Open "HyperTerminal" in your Windows PC and setup as follows:

Settings	
Baud Rate	**38400 (for SES board PRO-90-6601)**
Data Bits	**8**
Parity	**None**
Stop Bits	**1**
Flow Control	**None**

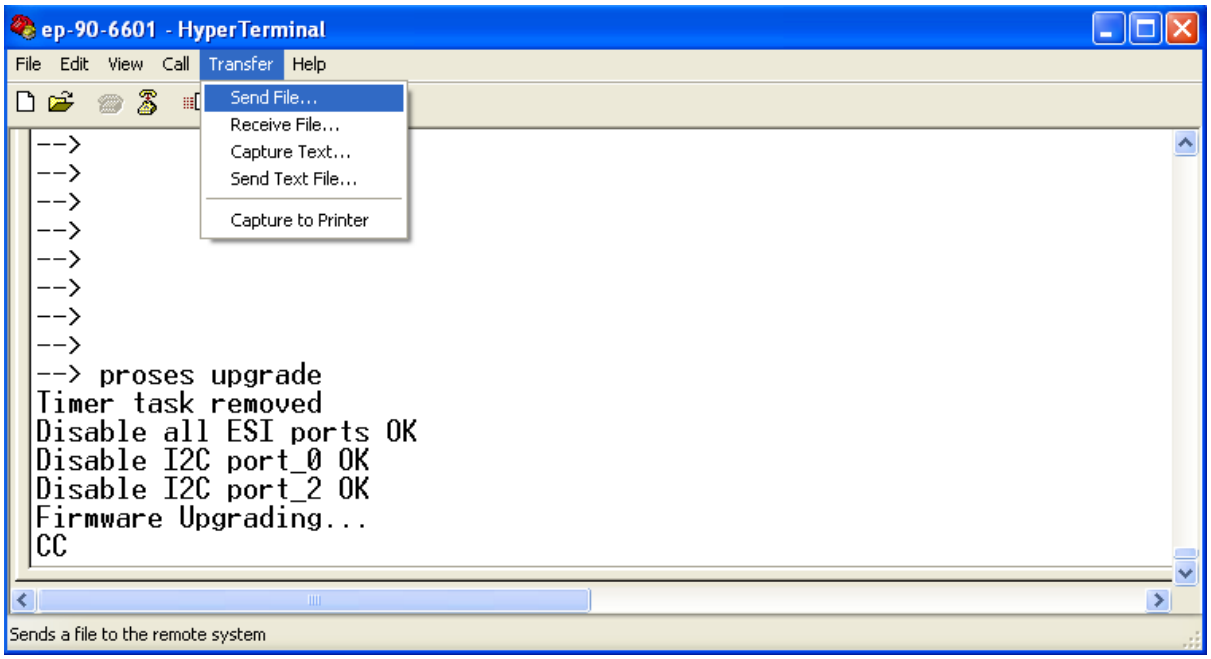
e. To access the SES console, press <ENTER> at least once to verify the SES console session has been established (a "-->" prompt should appear if configured properly).

f. At the prompt, type "**proses upgrade**", followed by <ENTER>.

```
--> proses upgrade_
```

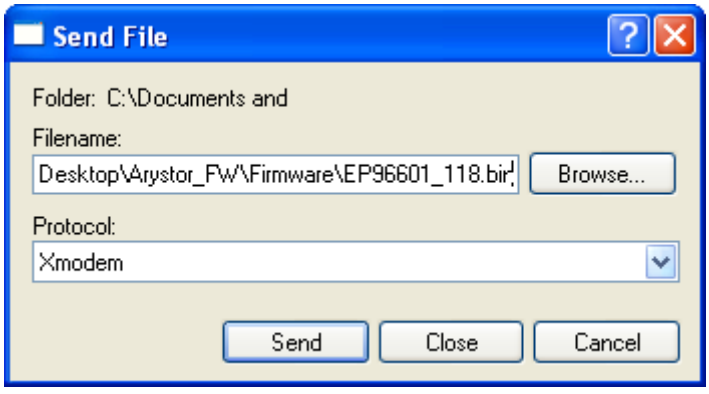
g. There will be CCCC letters displayed.

h. Go to the "**Transfer**" menu at the top of the HyperTerminal window, and select the "**Send File...**" option.

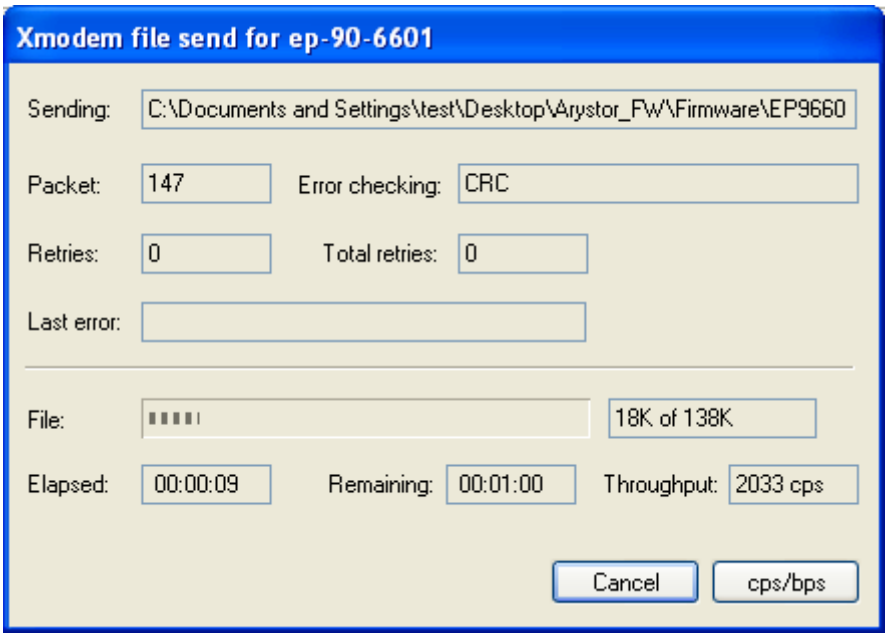


i. In the Send File message box, select "**Xmodem**" from the Protocol pull-down menu.

j. Select the "**Browse...**" button and locate the new firmware image file. Select firmware file "**EP96601_118.bin**" and click "Open".



k. Click "Send" to start upgrade process. The upgrade process will be shown.



l. Check if firmware upgrade is ok.

```
--> proses upgrade
Timer task removed
Disable all ESI ports OK
Disable I2C port_0 OK
Disable I2C port_2 OK
Firmware Upgrading...
CCFirmware Upgrade ok

--> _
```

m. Power off RAID subsystem.

n. Remove the SES module. Remove the jumper in JP8.

o. Repeat **steps "b" to "m"** then continue with **step "p"**.

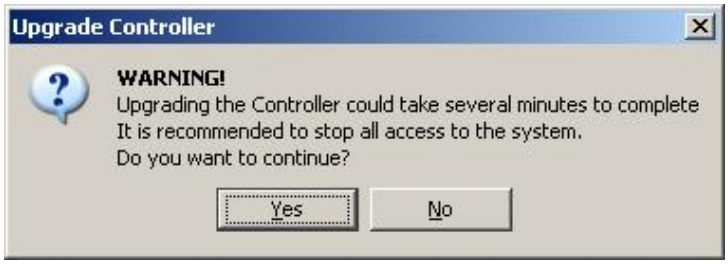
p. Power on the RAID subsystem. Use LCD panel to check if the new SES firmware has been updated. Use arrow down key.

4. To upgrade the controller firmware with bridge firmware 1.21:
   a. Login to proRAID Manager.
   b. Click menu **"Administration > Service Options > Controller Services > Upgrade Controller >"**.

NOTE: Please stop all IO operations to the RAID subsystem while upgrade takes place.

NOTE: Firmware upgrade process will auto-upgrade the second controller if you have redundant controllers in the RAID subsystem.

   c. Warning message will be displayed. Click "Yes" to start upgrade process which takes several minutes.


Upgrade Controller
WARNING!
Upgrading the Controller could take several minutes to complete
It is recommended to stop all access to the system.
Do you want to continue?
Yes
No

   d. Select the controller firmware binary file (version 1.21).
   e. When "Confirm Firmware Details" message box is displayed, select "Yes" to confirm upgrade.
   f. Upgrade process will start. Verify if new firmware is downloaded successfully.

5. Reset the controller(s) when prompted.
   a. Controller board(s) must to be reset. Select "Yes" to reset controller(s).

   b. Progress status of "Resetting Controller(s)" will be displayed.

   c. Verify if new firmware is updated in Monitoring → System Information.

6. Upgrade Expander Firmware

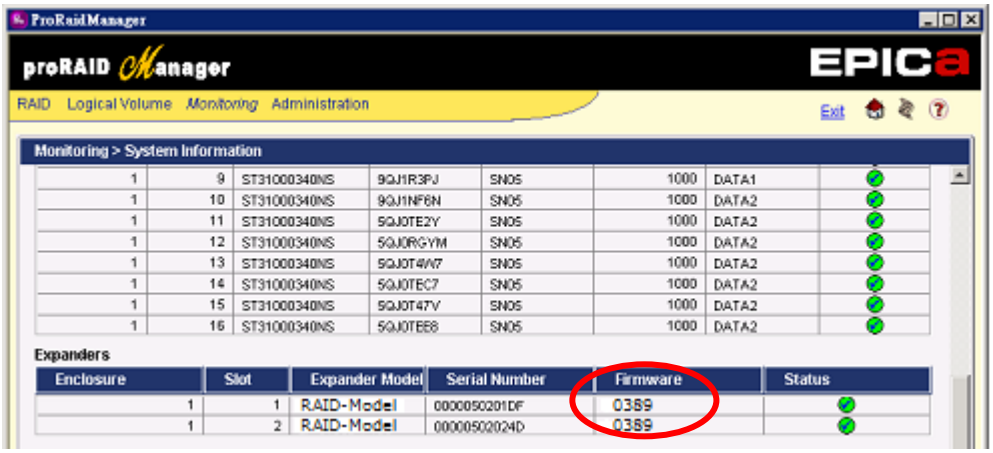
   a. Click menu **"Administration → Service Options → Controller Services → Upgrade Controller"**.

   b. Select "All Files" in File Type option, then choose the expander firmware file **v389.s3r**.

NOTE: Upgrading could take several minutes to complete. It is recommended to stop all access to the system and it takes around 4 minutes to upgrade each expander on the background.

NOTE: .bin image file can be used only when upgrading the Expander's firmware via RS232 while .s3r image file can be used only when upgrading the Expander's firmware via proRAID Manager.

   c. Double check if the new Expander Firmware is already displayed in the Expanders table in Monitoring → System Information.



7. Power off the RAID subsystem. Power on after several seconds.

8. Upgrade the Bottom Board Expander Firmware

WARNING: Upgrading can take several minutes. It is recommended to stop all I/O processes. The bottom boards consist of 4 expanders and each expander takes around 4 minutes to upgrade in the background.

NOTE: Make sure that the expander slots 147, 148, 151 and 152 are shown in proRAID Manager's Expanders table.

a. Login to your selected RAID subsystem and open proRAID Manager GUI. Select **Administration → Service Options → Controller Services → Upgrade Controller**.

b. Select "All Files" in File Type option, then click "**Browse**" and choose the firmware file (for example: EP914242-111.s3r).

c. Click "**Select**" to start the upgrade process.

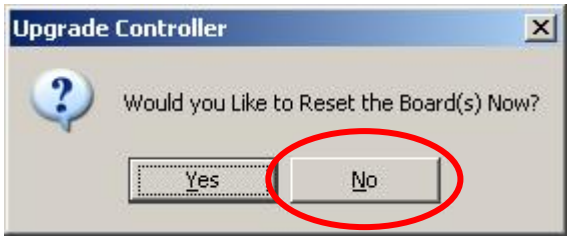
d. Do **not** perform any other actions until a message is displayed confirming that the installation is finished.

e. If a system reset is needed to run the new firmware, you will be prompted to do so.

f. After upgrade process has been completed, verify the new expander firmware.

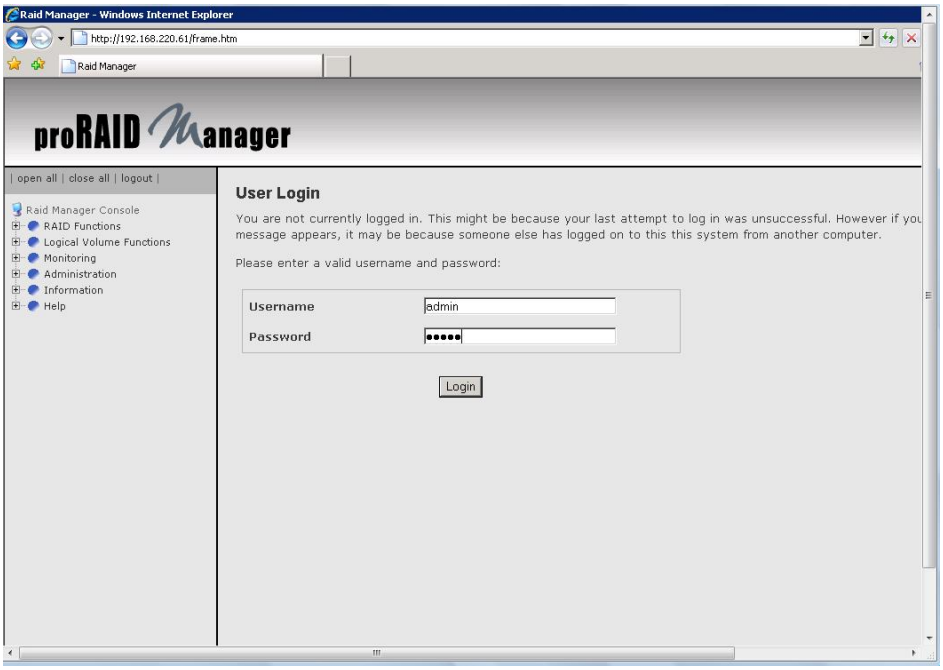
9. Upgrade Controller Firmware to Web GUI version 1.30.
   a. Click menu **"Administration > Service Options > Controller Services > Upgrade Controller >"**.
   b. Warning message will be displayed. Click "Yes" to start upgrade process which takes several minutes.
   c. Select the controller firmware binary file (version 1.30).
   d. When "Confirm Firmware Details" message box is displayed, select "Yes" to confirm upgrade.
   e. Upgrade process will start. Verify if new firmware 1.30 is downloaded successfully.

10. When prompted to reset the controller(s), select **"No"**.



11. Power off the RAID subsystem. Power on after several seconds.

12. Open web browser and type the IP address of controller. The proRAID Manager web-GUI version will be displayed.


Raid Manager - Windows Internet Explorer
http://192.168.220.61/frame.htm
Raid Manager
proRAID Manager
| open all | close all | logout |
Raid Manager Console
RAID Functions
Logical Volume Functions
Monitoring
Administration
Information
Help
User Login
You are not currently logged in. This might be because your last attempt to log in was unsuccessful. However if you
message appears, it may be because someone else has logged on to this this system from another computer.
Please enter a valid username and password:
Username
admin
Password
Login

NOTE: Default Username is "admin" and Password is "admin".

13. To verify the IP address of controller using LCD panel, press the ▼ button several times until you see the Controller IP menu. This menu displays the Controller IP address. Pressing the ▼ button will display second controller's IP address (will show 0.0.0.0 if there is no second controller).

NOTE: The LCD will display the IP address 2 minutes after power on, and subsequently refreshed every 15 minutes.
If the IP address is changed or reconfigured, the LCD will show the updated IP address within 15 minutes.

IMPORTANT!
ProSES board PRO-90-6601 will not show in the LCD the controller's IP address after upgrading the firmware to the web GUI version (controller FW 1.30, expander FW V389, proSES FW 1.18, and bottom board FW 1.11).
If proSES board is PRO-90-5601, the LCD will display the controller's IP address after upgrade.

14. For PRO-90-6601 SES board, to see the controller IP address, connect phone-jack-to-DB9 serial cable to the controller's RS232 port and to your computer's COM port. Then start terminal session with settings as follows: Bits per second: 115200, Data bits: 8, Parity: None, Stop bits: 1, and Flow Control: None. After connecting, login as "**netadmin**" without password. The screen will show the current IP setting.

```
login: netadmin

   ************Current ip setting*********
   Dynamic Ip address
   netmask    ::: 255.255.0.0
   inet addr  ::: 169.254.2.135
   gateway    ::: 0.0.0.0
   dns1       :::
   dns2       :::
   domain     :::
   *****************  end   **************

  -------------- Commands Available ------------
       set ip <ip_address>
       set ip <ip_address> <net_mask>
       set ip <ip_address> <net_mask><gateway>
       set ip dynamic          /*Enable dhcp*/
       show ip                 /*List ip settings*/
       menu                    /*List available commands*/
       exit                    /*Exit netadmin*/
  --------------        end        ------------

please enter a command
```

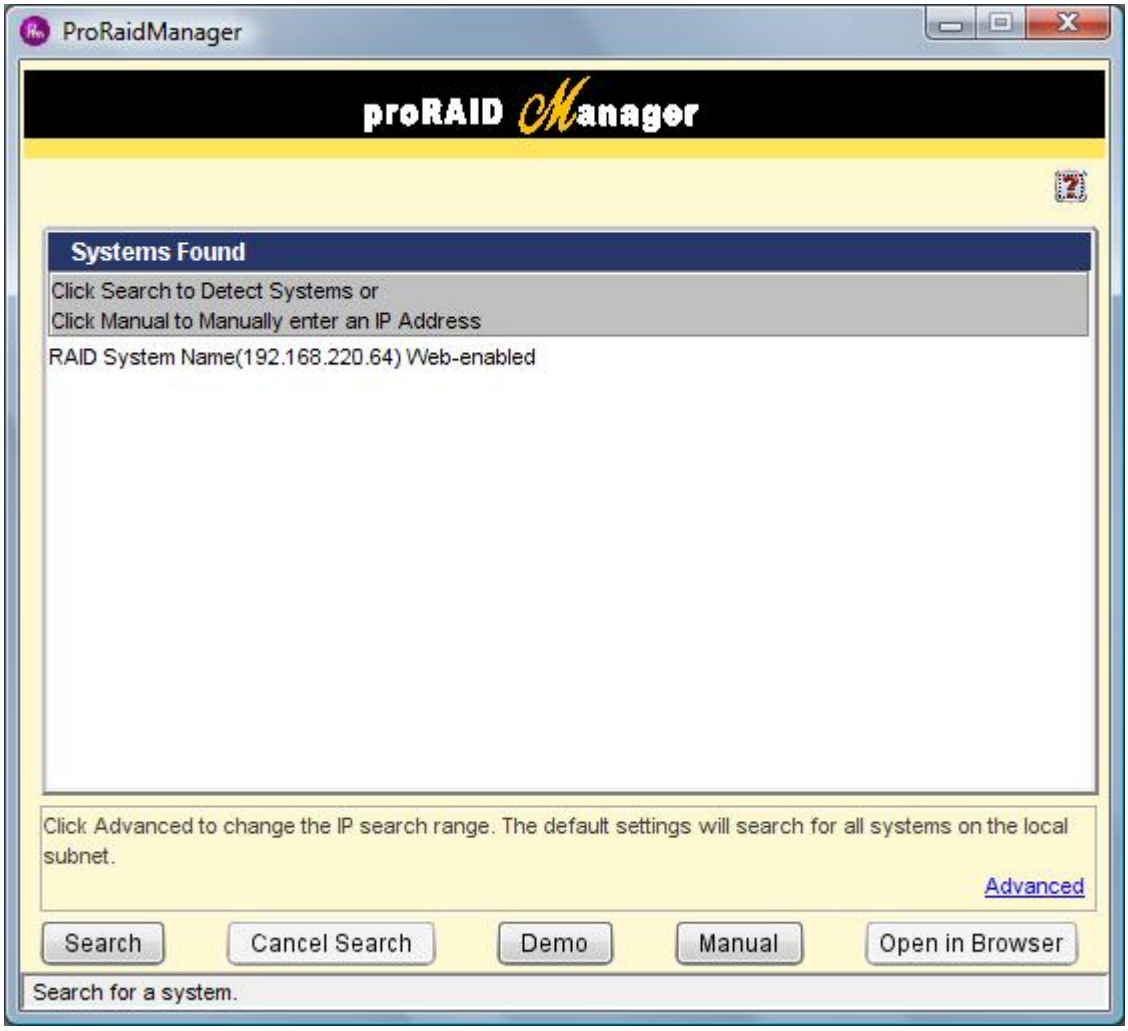
2. Using Java-based proRAID Manager to Search for IP

A new function is available in **proRAID Manager Version 1.5.37**.

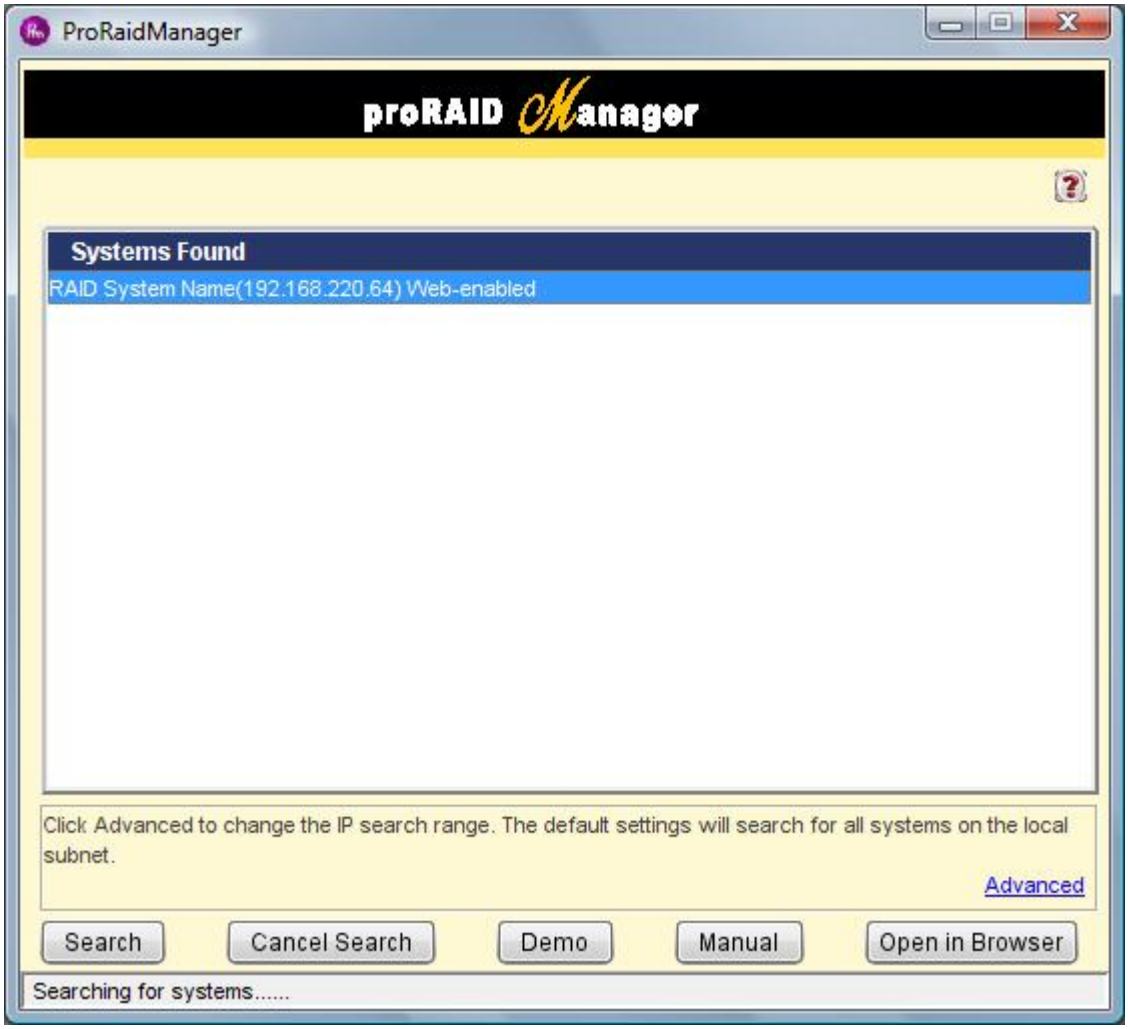
When proRAID Manager 1.5.37 or later version is installed, the IP of RAID systems in the network can be searched by opening the proRAID Manager

program.

After opening proRAID Manager, click the "**Search**" button. This will open another screen with the searched RAID systems.


ProRaidManager
proRAID Manager
Systems Found
Click Search to Detect Systems or
Click Manual to Manually enter an IP Address
RAID System Name(192.168.220.64) Web-enabled
Click Advanced to change the IP search range. The default settings will search for all systems on the local subnet.
Advanced
Search
Cancel Search
Demo
Manual
Open in Browser
Search for a system.

Select the RAID system you want to login. An option whether to open proRAID Manager in web browser is available. To open in web browser, click "**Open in Browser**" button. The proRAID Manager web GUI will be displayed.



If you want to open the java-based proRAID Manager, click "**Manual**" button. In the next screen, type the admin password and click "**Connect**". Note that you should be familiar with the java-based proRAID Manager.